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# **FOOD PROCESSING, DISTRIBUTION, AND ACCEPTANCE**

a program of research for the southern region



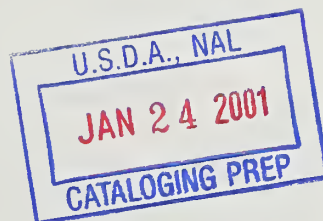
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# FOOD PROCESSING, DISTRIBUTION, AND ACCEPTANCE

a program of research for the southern region



Prepared by a Joint Task Force of the Southern Region Agricultural Experiment  
Stations and the United States Department of Agriculture

March 1975

# FOREWORD

Food processing, distribution, and acceptance involve those activities and services that move raw food products through the food chain to consumers. Traditionally, most of the raw foods have been produced on farms and have undergone processing for protection, preservation, change of form, and convenience for distribution and utilization. New systems of distribution and food service have evolved as needed. As the demand for food changes, new sources of raw food materials must be investigated, along with all the related technical, wholesome, nutritional, economic, and social factors.

Marketing margins have risen “persistently” and “relentlessly” for many years and have accounted for significant increases in the cost of food. The farmer’s share has ranged mostly from 37 to 41 percent during recent years. Thus, the marketing share has become of greater importance in the price of food and indications are that this trend will continue.

Research on the food supply by the Land-Grant Universities and USDA-ARS (Agricultural Research Service) has, in the long run, benefited the consumer. While short-term benefits have appeared to accrue to the food industry, any temporary gains have soon been passed on to the consumers in the form of lower prices for products and services.

The changes in the raw food materials and the food chain make it mandatory that research in the consumer’s behalf on his food supply be greatly increased in current areas and expanded to other important problems in the food chain, especially those beyond the farm gate.

The largest share of research funds related to food in the Land-Grant University and USDA-ARS has been assigned historically to the solution of problems surrounding the production of food. This Task Force report does not suggest that funds for production research be decreased. However, it does indicate that many potential benefits to the consumer will not be forthcoming unless research in food processing, distribution, and acceptance is expanded through increased support from the public sector. It has often been stated that the processing industry will do this research. This concept is challenged in this report and a rationale for the roles of Land-Grant Universities, USDA-ARS, and industry in food research is presented.

*The Task Force requests that the Structure for National and Regional Agricultural Planning be altered to include a Research Program Group (RPG) entitled “Food.”* Currently, three research programs entitled “Food Safety,” “Food and Nutrition,” and “Food Processing, Distribution and Acceptance” are located in RPG 5.00—People, Communities and Institutions. Much of the research in these programs is cross-listed in RPG 3.00—Crops and RPG 4.00—Animals. Establishment of an RPG 7.00—Food would (1) give recognition to the important role of research in the United States Department of Agriculture and the Land-Grant Universities relative to the food supply and (2) provide better identification of the Research Problem Areas (RPA) for those who wish to use this classification system either in planning research or in gathering information developed through research.



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# THE TASK FORCE REPORT

## PURPOSES

1. Establish the significance of food processing, distribution, and acceptance as an area of research in the overall food and agricultural research programs.
2. Describe important research problems in food processing, distribution, and acceptance in the Southern Region and suggest priorities and magnitudes of efforts.
3. Provide up-to-date data for regional and national planning efforts.

## RECOMMENDATIONS

1. That the structure for national and regional agricultural planning be altered to include a Research Program Group (RPG) entitled "Food."
2. That the total SMYs devoted to processing, distribution and acceptance of food be increased by about 50 percent to give a total of 500 SMYs.
3. That the task force continue with its original assignment and that the report be updated periodically.

## SUMMARY HIGHLIGHTS

1. Approximately 130,000 food establishments are located in the Southern Region. These organizations employ 1,481,000 workers and the annual value of their sales total around 56 billion dollars.
2. The industry which receives 60 percent of the food dollar is presently supported by only 327 researchers in the Southern Region; this may be estimated to represent about 10 percent of the manpower devoted to agricultural research in the Southern Region, if the region is typical of the United States as a whole.
3. It was the considered opinion of the Task Force that food research is a major responsibility of governmental and educational institutions.
4. The Task Force identified 10 broad areas of research, assigned priorities to each, and suggested increases in manpower to bring the total effort of the universities and governmental agencies to 500 SMYs (see Table 1).

**TABLE 1. Current and Recommended Percentage Distribution of Food Research Manpower in the Southern Region by Problem Areas\***

Problem Area	Priority (1-4)	Current Effort		Recommended Effort		
		SMY	%	SMY	%	% Increase
I	3	68.2	20.8	70.0	14.0	2.6
II	1	59.3	18.1	85.0	17.0	43.3
III	1	61.1	18.7	90.0	18.0	47.3
IV	2	29.6	9.0	50.0	10.0	68.9
V	3	37.2	11.4	45.0	9.0	21.0
VI	1	34.1	10.4	60.0	12.0	75.9
VII	2	4.5	1.4	20.0	4.0	344.0
VIII	1	8.0	2.4	25.0	5.0	213.0
IX	3	23.3	7.1	40.0	8.0	71.7
X	2	2.2	0.7	15.0	3.0	582.0
TOTAL		327.5	100.0	500.0	100.0	52.6

\* Additional information on problem areas and manpower distribution is presented in Table 8. See page 8.



# Food Processing, Distribution, and Acceptance Research

The Southern Regional Agricultural Research Planning Committee has established a comprehensive list of potential research-program task forces. Several of these task forces have been appointed and have made reports. Some of those relating to subject matter areas referred to in this report are Beef Cattle, Dairying, Poultry, Soybeans, Fruits and Nuts, Vegetables, Food Safety, and Food and Nutrition. While the commodity task force reports encompass all the research problems surrounding the particular commodity, an examination of the reports indicates that major emphasis was given to production problems. This is understandable because most of the commodity task force members were associated with the production segments of the food supply.

The Food Processing, Distribution, and Accep-

tance Task Force is composed primarily of members who have food science and processing experiences. The members accept the important relation of this assignment to that which has been done by the other task forces. No attempt is made to minimize the need for cooperative and coordinated planning and execution of research between production and processing. Rather, it is hoped that this report will promote further cooperation and give added dimension and emphasis to the contributions that can and should be made by food scientists. Everyone recognizes that each step in the system of producing, processing, distributing, and utilizing of food must be supported by adequate knowledge if the system is to function effectively. It is in this spirit that the members of this task force have prepared this report.

## The Food Businesses in the Southern Region

The food industry in the Southern Region is large and diverse. Several tables are included in this report to help describe the nature of this industry by state and region. Unfortunately, data were not available on Puerto Rico and the Virgin Islands which are a part of the Southern Region. Additional information for each state appears in the Appendix.

### Food and Kindred Products Businesses

The food and kindred products businesses in the different states in the Southern Region are pre-

sented in Table 2. These firms are known more familiarly as food processors. Although there is a relatively large number of food processors, they are quite small as individual operations; most have less than 20 employees. In fact, plants with less than 100 employees should be classified as small. Probably, 90 percent of the food processors would fall in this category. The numbers of employees, magnitude of payroll, costs of materials, value added by manufacturing, and total value of shipments reflect the large size of this segment of the food industry and its contribution to the economy of the area.

TABLE 2. Food and Kindred Products Businesses in the Southern Region<sup>1</sup>

State	Establishments With 20		All Employees		Value Added by Manufacture (Million \$)	Cost of Materials (Million \$)	Value of Shipments (Million \$)
	Total Number	Employees or More	Number (1000)	Payroll (Million \$)			
Alabama	415	191	24.6	158.8	341.6	986.1	1343.0
Arkansas	338	174	24.8	139.9	353.7	1221.2	1564.7
Florida	793	333	44.4	331.2	973.2	2108.6	3062.5
Georgia	661	293	45.4	305.6	822.1	1799.0	2612.3
Kentucky	387	193	22.0	186.9	707.1	1110.4	1815.7
Louisiana	561	284	28.7	202.1	584.3	1374.0	1973.4
Mississippi	304	151	17.0	101.8	224.1	725.4	952.2
North Carolina	659	307	37.4	249.9	637.9	1392.5	2026.2
Oklahoma	330	138	14.3	105.1	238.0	688.0	924.3
South Carolina	254	109	12.1	75.5	176.7	424.9	598.7
Tennessee	535	257	32.8	257.0	697.9	1952.4	2624.6
Texas	1468	651	76.7	542.5	1684.8	3865.3	5524.8
Virginia	507	283	33.8	220.3	612.8	1361.3	1965.3
TOTAL	7212	3364	414.0	2876.6	8054.2	19009.1	26987.7

<sup>1</sup> Code 20 Preliminary Report 1972 Census of Manufacturers, U.S. Dept. of Commerce, April 1974

### Numbers of Food Processors by Commodities

Some idea of the distribution of numbers of food processors by commodities and by states is presented in Table 3. The number of firms may not be the best estimate of the exact size and nature of an industry within the area. But this information does show the relative importance of an industry and, perhaps, it is the best estimate currently available. Meat processors are quite numerous in Texas, North Carolina, Georgia, and Tennessee. Florida and Texas are the major processors of fruits and vegetables. Texas, Florida, Kentucky, and Tennessee lead in dairy products processing. Arkansas, North Carolina, Alabama, and Georgia may be considered the intensive poultry-processing states. Several other food commodity processors are listed because they are important

parts of the food industry. Most of the grain produced in the Southern Region is used for animal feed. However, large quantities of food ingredients are imported into the area to supply the bakery processors and other food manufacturers. Fats and oil processors produce food ingredients for use within and outside the area and for export.

### Wholesale Food Businesses

The magnitude of the wholesale food business is presented in Table 4. These wholesale grocery and brokerage businesses perform essential services in the distribution of food. The number of firms, size of their payrolls, and total sales reflect their importance. Their problems must be considered as a part of the research program in food processing and distribution.

TABLE 3. Food and Kindred Products Business by Commodities in the Southern Region<sup>1</sup>

State	Meat <sup>3</sup> Products (Number)	Poultry Dressing (Number)	Dairy Products (Number)	Fruits and Vegetables (Number)	Grain Mill Products (Number)	Bakery Products (Number)	Sugar and Confectionary (Number)	Fats and Oils (Number)	Beverages (Number)	Miscellaneous (Number)
Alabama	59	27	46	13	79	38	10	20	59	64
Arkansas	48	35	27	25	65	23	(NA)	23	52	(NA)
Florida	84	(NA) <sup>2</sup>	74	116	60	110	32	15	105	197
Georgia	121	27	48	33	120	60	22	24	96	110
Kentucky	72	(NA)	71	10	48	31	(NA)	7	98	41
Louisiana	80	11	58	28	47	44	59	23	61	145
Mississippi	43	19	30	8	39	25	(NA)	30	60	46
North Carolina	124	32	45	24	128	66	(NA)	28	98	(NA)
Oklahoma	60	6	32	21	46	40	(NA)	18	51	(NA)
South Carolina	36	7	27	16	31	15	(NA)	(NA)	53	(NA)
Tennessee	108	(NA)	66	30	81	57	16	25	81	71
Texas	282	34	110	92	199	145	57	75	202	300
Virginia	57	12	47	45	52	49	22	18	64	141
TOTAL	1174	210	681	461	995	703	218	306	1080	1115

<sup>1</sup> Code 20 Preliminary Report 1972 Census of Manufacturers, U.S. Dept. of Commerce, April 1974

<sup>2</sup> NA Not available

<sup>3</sup> Meat Products except where poultry dressing is separated

TABLE 4. Wholesale Food Businesses—Groceries and Related Products in the Southern Region<sup>1</sup>

State	Establishments (Number)	Sales (Million \$)	Payroll Entire Year (Million \$)
Alabama	489	1058.5	56.6
Arkansas	352	693.3	30.9
Florida	1784	3910.1	208.5
Georgia	831	1969.5	97.6
Kentucky	483	787.2	43.0
Louisiana	734	1614.6	73.2
Mississippi	364	658.8	35.0
North Carolina	886	1742.9	86.6
Oklahoma	355	843.1	40.7
South Carolina	452	793.3	40.1
Tennessee	660	1765.2	78.6
Texas	1840	4840.1	224.0
Virginia	628	1444.8	73.3
TOTAL	9858	22121.4	1088.1

<sup>1</sup> Code 514 U.S. Dept. of Commerce News, Dec. 24, 1973



## Retail Grocery Stores

The U.S. Department of Commerce stated that, measured in dollar value of sales, retail grocery stores were the most important kind of retail business in each of the states in 1972. The number of stores, people employed, payroll, and sales are presented in Table 5. Not only do retail grocery stores constitute a primary channel in food distribution, but they are becoming more important sources of delicatessen or ready-to-serve food items.

## Public Eating Places

The feeding of people in public places and away from home is increasing in importance. Table 6 presents the number of establishments, paid employees, payroll, and sales. Providing these food preparation services is a substantial business that offers employment for many people. These businesses have many problems in maintaining food quality and safety in an acceptable and efficient manner.

**Table 5. Retail Food Stores in the Southern Region<sup>1</sup>**

State	Establishments (Number)	Paid Employees for Week including March 12, 1972 (Thousands)	Payroll Entire Year (Million \$)	Sales (Million \$)
Alabama	3044	22.9	97.9	1340.4
Arkansas	1878	12.4	54.4	761.8
Florida	7133	73.3	327.1	4042.0
Georgia	4103	33.4	152.4	2046.9
Kentucky	2414	22.1	101.6	1355.2
Louisiana	3444	28.3	124.3	1671.7
Mississippi	2391	13.8	56.2	822.7
North Carolina	4739	35.6	161.8	2131.7
Oklahoma	2175	19.2	92.5	1154.5
South Carolina	2249	19.1	80.5	1105.6
Tennessee	3832	29.0	123.8	1707.8
Texas	10921	95.0	413.5	5355.0
Virginia	3534	36.8	188.7	2190.5
<b>TOTAL</b>	<b>51857</b>	<b>440.9</b>	<b>1974.7</b>	<b>25685.8</b>

<sup>1</sup> Code 54 U.S. Dept. of Commerce News, Dec. 17, 1973

**Table 6. Eating and Drinking Places in the Southern Region<sup>1</sup>**

State	Establishments (Number)	Paid Employees for Week including March 12, 1972 (Thousands)	Payroll Entire Year (Million \$)	Sales (Million \$)
Alabama	2917	26.5	72.6	346.0
Arkansas	2081	14.9	38.5	184.5
Florida	9762	132.0	392.6	1790.7
Georgia	4346	50.2	157.3	724.9
Kentucky	2952	31.8	88.9	418.3
Louisiana	4074	34.4	106.7	482.1
Mississippi	1943	13.7	36.6	174.0
North Carolina	4790	44.0	137.2	625.5
Oklahoma	3433	31.1	79.1	353.9
South Carolina	2248	22.5	63.9	301.6
Tennessee	4413	38.9	112.5	521.5
Texas	14081	137.9	408.6	1848.3
Virginia	4068	48.4	148.0	633.6
<b>TOTAL</b>	<b>61108</b>	<b>626.3</b>	<b>1571.8</b>	<b>8404.9</b>

<sup>1</sup> Code 58, U.S. Department of Commerce News

## Summary of Food Businesses

A summary of the food and food-related businesses in the Southern Region, which embraces the 13 southern states, is presented in Table 7. These businesses should represent the major inputs into the food supply as the food supply moves through the system from the farm to the consumer. By almost any measure, these inputs are quite large and affect many people as employees and everyone in the region as consumers. While the food business is large in the aggregate, it is comprised of a big number of small enterprises. Most of the food processors have fewer than 20 employees, and the average number of employees for the retail food stores and public eating places is 10 or less. These businesses are not large enough to afford and support research programs. Thus, if the consumer is to benefit from new technology and knowledge, support for needed research must come primarily from the public sector.

Demands for food are changing greatly in the national and international markets. The increasing population creates a demand for a larger tonnage of food or food nutrients. Affluence among

the Americans and people of the other developed countries is causing a shift to more animal-based food products. If this use of grain for animal feeding should continue, it could create greater competition and demands for raw food sources. It is generally estimated that 7 to 10 pounds of grain are required to produce 1 pound of beef. Eating habits are changing toward convenience foods, prepared meals, and meals away from home.

Changes in food consumption patterns are having a tremendous effect on the use of raw food resources and on processing or handling throughout the food system or food chains. Raw food materials, especially those from grain and oil seed sources, require conversion to human foods. This often necessitates formulation and fabrication of food analogs or completely new foods. Protecting the food over the distances and periods of time between its production and the places where it is consumed requires very complex handling, storage, and delivery systems. Meal preparation, whether in the processing plant, institution, restaurant, or home creates the need for more technological, economic, and social knowledge.

**Table 7. Summary of Food and Food Related Businesses in the Southern Region**

Kind of Business	Code	Establishments With 20 Employees Total (Number)		All Employees Number (1000)		Value Added by Manufacture (Million \$)	Cost of Materials (Million \$)	Value of Shipments (Million \$)	Sales (Million \$)
		or More (Number)		(Million \$)					
Food and Kindred Products	20	7212	3364	4140	2876.6	8054.2	19009.1	26987.7	(NA)
Wholesale Groceries and Related Products	514	9858	(NA) <sup>1</sup>	(NA)	1088.1	(NA)	(NA)	(NA)	22121.4
Retail Food Stores	54	51857	(NA)	440.9	1974.7	(NA)	(NA)	(NA)	25685.8
Eating and Drinking Places	58	61108	(NA)	626.3	1571.8	(NA)	(NA)	(NA)	8404.9
TOTALS		130035	3364	1481.2	7511.2	8054.2	19009.1	26987.7	56212.1

<sup>1</sup> NA Not Available or Not Applicable

## Interactions With Other Task Forces

A rapid scanning of the Commodity (Beef, Dairy, Poultry, Fruit, Vegetable, Soybean, etc.), Food Safety, and Food and Nutrition Task Force Reports might cause a person to conclude that there is unnecessary duplication and overlap among them. However, a careful reading of each report will soon convince one that (1) there is a different major thrust in each and (2) there is no unnecessary overlap. In fact, it will be found that each report usually adds support and strength to the others.

The primary emphasis in the Food and Nutrition Report is on RPAs 703—Food Choices, Habits and Consumption, 704—Home and Commercial Food Service and 708—Human Nutrition. Major efforts in the Food Safety Report are centered around RPAs 701—Insure Food Products Free of Toxic Contaminants and 702—Protect Food and Feed Supplies from Harmful Microorganisms and Naturally Occurring Toxins. The Commodity Task Force Reports have most of their problem areas classified under the RPAs in the 200 and 300 series. Where interest was shown in food processing,

RPAs in the 400 series were added. However, it seems to be a fair judgment that greater emphasis was given to production problems in the Commodity Task Force Reports. The Food Processing, Distribution, and Acceptance Task Force Report gives highest priority to RPAs in the 400 series. Recognition was given to the need for interaction with the production sector of agriculture by including some RPAs in the 300 series and with the other task force subject-matter areas by including RPAs in the 500, 600, and 700 series. A close scrutiny of the research approaches in the reports will often show that even though the research problems may have the same RPA classification, the objectives may be quite different.

This Task Force wishes to state categorically that many benefits are to be gained by interaction among research planning groups and scientists. The multidisciplinary attack is often more effective in solving problems and in developing useful knowledge. Also, this approach can be more efficient if it reduces unnecessary duplication of equipment and other resources.



# Responsibilities of Universities, USDA, and Industry for Food Research

Frequently, food scientists in the universities are confronted with the question, why doesn't the food industry do its own research? Or occasionally, isn't that a problem for the federal government? Oftentimes, members of the food industry ask why the universities or government do not conduct research on certain food problems? Because of the lack of knowledge and understanding of research needs and responsibilities in food processing, distribution, and acceptance, it seems appropriate to include some discussion of the problem in this report.

## University Research in 1862 and 1890 Land-Grant Institutions

Food research in the universities is supported from several sources. These are Federal appropriations through the Cooperative State Research Services (CSRS), federal grant and contract funds from several agencies, State appropriations, industry grants and contracts, and foundation funds. The sources and magnitude of funds have an influence on the nature of the research services performed.

The land-grant universities offer two unique dimensions through their research programs. One, the universities' research programs at several institutions are intimately associated with the graduate teaching programs. It is through the mechanism of professor-as-teacher to the graduate research student that much university research is conducted. Thus, knowledge is developed and more professional scientists are prepared. Secondly, Extension Specialists in the Cooperative Extension Service take these research results directly to the people or to those who can benefit from their use. The Southern Region is fortunate in having well-staffed Extension Services that receive substantial financial support from the southern states.

In addition, land-grant universities have a responsibility to conduct research to develop knowledge and solve problems beyond that which is possible in the training function. New knowledge, developed through basic research, is usually of considerable interest to large food companies that can translate this knowledge to meet their needs. Small food companies do not have the means of conversion and, thus, they need a more applied type of assistance. These small food companies are often successful in influencing state legislatures to appropriate funds to support applied research. The university accepts these funds in order to assist in developing businesses that will provide markets for local products and provide employment. Large numbers of small food businesses comprise a vital part of the total food business.

These small businesses provide services that perhaps would not be available through large national and multinational companies; and it is believed to be in the public interest to keep them functioning and healthy.

Much is being said about the need for more interdisciplinary research as a means of solving the complex problems of the food industry. It is expensive for industry and government to acquire large permanent-type interdisciplinary teams because problems change when the type and magnitudes of specific disciplinary inputs change. The university should be uniquely qualified to cope with these interdisciplinary approaches to the solution of problems. There is a wide array of interdisciplinary talent on the university campuses that can be employed for this type of research. The primary problem in utilizing this talent is the lack of adequate funding.

University faculties are criticized occasionally for lack of productivity in research. Much of this criticism is unjustified because the responsibilities of individuals are not understood. For example, if there is only one faculty member that has the responsibility for poultry products research, he probably has a multitude of duties that surround it. He may be called upon to teach a course, serve on various committees, answer industry questions and lastly, conduct research on poultry products. If a university expects its researchers to have an impact on the knowledge in a subject matter area, then consideration must be given to the critical mass of effort required to make this contribution.

The university is also in a unique position to serve regulatory agencies and the public interests. Since knowledge and its transmission are the only thing that the university has to "sell," this expertise, because it does not represent vested interests, is often more acceptable than that from business sources.

Each state may have situations that do not equally apply to the Southern Region; this provides an opportunity for the local institutions to make unique research contributions. Continuing support from the USDA and the States should be maintained.

## USDA-ARS Research

Two large federally supported research laboratories, plus several smaller outlying facilities, are located within the Southern Region. A large portion of these resources is used for food research of regional and national significance that often requires staffing and funding beyond the capabilities and priorities of individual states.

The federal establishments have been equipped

to conduct basic and applied research. Both grants and contracts have been used to further their in-house research interests. In addition, arrangements are possible with universities whereby faculty and students may use the facilities for research, sabbatics and special intern-type training.

### **Food Industry Research**

A survey of research (Canner/Packer—Complex 20), conducted by the food industry, has revealed that expenditures by the 20 largest firms accounted for 75 percent of the total research and development (R & D) effort. These firms spent an average of 0.6 percent of net sales. Approximately 5 percent of the total funds spent for R & D was classified as basic research. The major portion of the R & D funds was spent toward competitive factors of new product development and added consumer convenience. Industry research is directed on the basis of the influence that the potential results will have on the return on investment.

Some spokesmen for universities, governmental agencies, and industry have stated that all R & D research should be conducted by the food industry and thus not by public institutions. The implication is that public institutions should research raw food product production but the commercial food industry should provide the remainder of the knowledge required to meet the food needs. Their statements have appeared irresponsible because of their lack of clarification of R & D research. When these spokesmen are asked for their specific descriptions of R & D research, they are usually referring to those competitive marketing factors, such as product alteration for brand identification, product and packaging innovation, and added consumer convenience and acceptance. If most people were to accept this narrow definition of R & D, there would be little disagreement.

While no statistics are available, it is estimated that universities are doing less research on the "competitive marketing-type factors" than industry is doing on basic research, i.e. about 5 percent.

Universities do some of this research to assist the small food companies within their jurisdiction and to have a knowledge of the functional properties of foods and food ingredients.

On the other hand, R & D research is more often defined to include all research that is performed other than the most basic. In the extreme, this would infer that research that had a reasonable immediacy of application would not be basic but would be applied or R & D. It is impossible to establish definitive limits for basic, applied, R & D and market-type research. However, it is in the public interest for its institutions to develop basic knowledge and to apply this knowledge to the solution of problems relating to the food supply. It is academic whether it is more important for researchers to take basic knowledge and use it to enhance the food supply or to start with a current food problem and have to develop basic knowledge to find the solution. The food supply of the nation and world is too important to permit jurisdictional discussions to influence negatively the amount of effort that should be used to develop the knowledge to assure an adequate food supply. A far smaller percentage of public and industry funds is used for research to support the food supply than is spent on industries and businesses that are less vital to man's survival.

Some of the large food firms have accepted contracts from government agencies to do certain types of research. Also, the food industry has provided direct assistance to universities for research on food problems.

A mutually exclusive role in performing food research cannot be assigned to business, government, or universities because each has unique interests, qualifications, and capabilities for research. It is in the public interest (1) that an adequate program of research on the food supply be performed, (2) that those who assume responsibility for directing research be aware of the needs of the food industry and consumer, and, (3) that cooperative planning and use of resources be coordinated wherever it is possible.



## Research Problem Areas

The preparation of this task force report evolved through two stages. First, a planning committee composed of SAES, CSRS, and USDA-ARS personnel met to discuss the need, purposes, and general parameters of a report on food processing, distribution, and acceptance. There was representation from all the states and territories and USDA in the Southern Region. There was general agreement on the need for a report on this research area. Considerable time was spent on listing and describing the research problem areas (RPAs) in food processing, distribution, and acceptance. Groups were requested to develop more specific and detailed descriptions of the respective RPAs. The minutes of the planning meeting and the descriptions of RPAs were circulated to those in attendance and to other interested persons. Then, another meeting was called to prepare a task force report entitled Food Processing, Distribution, and Acceptance.

The Task Force spent much time discussing the most important RPAs and finally divided them into 10 areas. These RPAs are summarized in Table 8 and the details are presented under each RPA on subsequent pages. Any RPA that was not

considered to have a priority rating of 3 or higher was not included in this report.

No attempt has been made to describe the problems in terms of individual research projects. If this were done, the list would be unmanageable. Also, it is believed that food scientists and associates are well qualified to develop projects that are adapted to their needs and resources.

Priority ratings are presented. The Task Force recognizes that each state or agency may have different priorities and that current priority ratings will change. Researchers who have primary interests in commodities are encouraged to review the appropriate commodity task force report.

The Task Force made a survey to determine the current number of SMYs assigned to each RPA in the Southern Region. Then, it suggested allocations of SMYs to RPAs if no increase were available, if there were a 10 percent increase in SMYs and based on its judgment as to the SMYs needed to perform an acceptable level of effort for each RPA. A minimum increase of 52 percent in total SMYs in food processing, distribution and acceptance research was believed essential to meet the food needs of the people. These recommendations are summarized in Table 8.

**Table 8. Summary Table of Manpower Distribution (SYMs) by Problem Areas<sup>1</sup>**

Problem Area	Priority (1-4)	Current	No Increase	10% Increase	Recommended Increase
I. Raw Products Quality	3	68.2	58.0	68.2	70.0
II. New Products and Processes	1	59.3	61.3	64.2	85.0
III. Maintenance of Quality During Processing, Storage, Distribution	1	61.1	63.1	66.0	90.0
IV. Food Acceptance and Consumption	2	29.6	30.8	32.9	50.0
V. Storage, Distribution, and Market- ing Systems for Food	3	37.2	34.4	37.2	45.0
VI. Nutritive Values	1	34.1	36.1	39.0	60.0
VII. Foods for Convenience	2	4.5	5.7	7.8	20.0
VIII. Energy, Water, and Waste Management	1	8.0	10.2	12.9	25.0
IX. Assessment of Quality	2	23.3	24.5	26.6	40.0
X. Assessment of Effects of Science	2	2.2	3.4	5.5	15.0
TOTAL		327.5	327.5	360.3	500.0

<sup>1</sup> Allocations of SMYs to RPAs are recommended on the basis of no increase in SMYs, a 10 percent increase in SMYs and a 52 percent increase in SMYs.

With 60 percent of the food dollar being spent for food because of the treatment it receives after it leaves the farm, it is inappropriate to even consider a possible decrease of manpower in the subject matter area covered by this report. Also, while it is recognized that the total funds expended for agricultural research in the Southern Region

are considerably below that which can be strongly justified, the inappropriateness of any consideration to decrease the funding in processing is made more apparent when it is realized that only 10 percent of the current budget is allocated to processing, distribution, and acceptance.

## PROBLEM AREA I

### Raw Product Quality Requirements for Fresh and Processed Foods

Research Problem Area	Priority (1-4)	Current	Number of Scientific Man Years (SMYs)		
			No Increase	10% Increase	Recommended Total
I	3	68.2	58.0	68.2	70.0

### Situation

If American agriculture is to maintain its pre-eminent position at home and abroad, it is imperative that we continue to accelerate the development of new and/or improved systems to maximize both quantity and quality of raw and processed food products. Innovations in the procedures of food production continue to reshape these operations to such an extent that new problems are created for food processors. Therefore, research needs to be directed toward the development of methods, procedures, and equipment for a comprehensive appraisal of raw materials to assure the quantity and quality of foods.

### Objectives

A. Develop a set of meaningful quality attributes in terms of nutrition, wholesomeness, and acceptability, and relate quality of raw commodity to acceptance of finished products.

B. Establish interdisciplinary research programs so that new and improved production systems will result in maximized yield of raw and processed products, as well as optimum quality and consumer acceptance.

### Research Approaches

Research in this area will include the wide spectrum of raw product sources, such as (1) fruits and vegetables, (2) field crops, (3) beef, poultry, pork, and dairy products, and (4) fish, shellfish, and other seafood. Special attention will also be directed at present and/or new sources for concentrates and nutritional isolates as they become relevant to food fortification and production of fabricated foods.

A. In accordance with existing standards of quality and/or as new guidelines are established, present and new varieties, breeding lines, and/or germ plasm will be screened, and their

quality attributes, nutritional, and toxicological characteristics will be objectively defined for raw and processed products.

B. Methodology will be developed to determine changes in quality of products during the various postharvest and postmortem operations. As an example, relative to mechanical harvesting of fruits and vegetables, studies will be conducted to examine its impact on grade distribution and to develop suitable sorting devices compatible with final utilization. Methods will also be developed to measure the physical, chemical, and biological changes which occur during harvesting, slaughtering, handling, curing, storing, packaging, and transporting of new products.

C. While such factors as breeding line, variety, population density, nutrition, irrigation, pesticides, and growth regulators are manipulated to maximize yield, maximum interdisciplinary effort will be exercised to investigate the interactive effects of these factors on quality of the raw and processed products. The term quality here includes sensory, objective, nutritional, and toxicological characteristics.

### Classification Guidelines\*

#### Research Problem Areas

RPA 318, 402, 404, 405, 408, 409, 412, and 904

#### Commodities

0600	0800	0900	1000	1100	1200
1400	1500	1600	1700	1800	2000
2200	2300	2400	2500	2700	2800
2900	3000	3100	3200	3300	3500
3800	6700	6800			

\* Manual of Classification of Agricultural and Forestry Research—Revision II



## PROBLEM AREA II

### The Technology of New and Improved Food Products and Processes

Research Problem Area	Priority (1-4)	Current	Number of Scientific Man Years (SMYs)		
			No Increase	10% Increase	Recommended Total
II	1	59.3	61.3	64.2	85.0

#### Situation

The development of new products or processes requires technological information for successful adaptation by the food industry. New and improved food products and processes can reduce costs, increase the variety and nutritive value of foods, expand the total food supply and provide agricultural commodities for new domestic and export markets. Product development and improvement can simplify storage, preparation, and merchandising of foods and meet specialized needs of consumers. Recent increases in the consumption of convenience foods and acceptance of fabricated foods assure their continued acceptance providing that the safety and high quality of these food products can be maintained. New or improved processes may increase efficiency, improve product quality, minimize water use and abate environmental pollution. There is a need to establish the effects of these processes on the acceptance, nutritive value and safety of conventional as well as of new products prior to their adoption by industry.

#### Objectives

A. Expand basic and applied scientific knowledge of the chemical, physical, and biological properties of foods in relation to the development of new or improved food products.

B. Improve efficiency of food manufacture via modifications in techniques and equipment of existing processing systems and/or developing entirely new processes.

#### Research Approaches

- A. (1) Evaluate the chemical composition, physical attributes, and microbiological characteristics of food and food components that determine color, flavor, texture, and nutritive value.  
(2) Develop new techniques for objective measurements of food quality attributes and

identify for each food product the necessary combination of chemical and physical characteristics for maximum acceptability.

(3) Determine the mechanics and kinetics of biochemical and chemical reactions that occur among constituents of food products under conditions of processing and storage.

(4) Elucidate physical and chemical interactions among food compounds that affect food texture, appearance, or acceptability.

(5) Develop new food products with improved nutritive value, better handling characteristics, and improved storage stability.

- B. (1) Design, modify, and develop new or improved food processes and equipment to improve efficiency of plant operations.

(2) Determine the effect of equipment and processing parameters on product quality and safety, water utilization, waste reduction, and costs.

(3) Evaluate the effect of new technological developments when applied to foods, product acceptability, safety, and nutritive value.

(4) Develop the technology for economically viable and efficient small processing plants.

#### Classification Guidelines\*

##### *Research Problem Areas*

RPA 314, 318, 403, 406, 410, and 604

##### *Commodities*

0600	0800	0900	1000	1100	1200
1400	1500	1600	1700	1800	2000
2200	2300	2400	2500	2700	2800
2900	3000	3100	3200	3300	3500
3800	6700	6800			

\* Manual of Classification of Agricultural and Forestry Research—Revision II

## PROBLEM AREA III

### Maintenance and Protection of Food Quality During Processing, Storage, and Distribution

Research Problem Area	Priority (1-4)	Current	Number of Scientific Man Years (SMYs)		
			No Increase	10% Increase	Recommended Total
III	1	61.1	63.1	66.0	90.0



## Situation

Various physical, chemical, and biological factors can adversely affect the quality, safety or wholesomeness of processed foods during processing, storage and distribution. Such factors include structural damage or injury of the food because of (1) poorly designed processing methods or equipment, (2) exposure to adverse environmental conditions (heat, light, relative humidity, oxygen tension), or (3) insect or rodent attack. Detrimental changes in desirable sensory attributes (aroma, flavor, texture, and color) may also occur as a result of these influences or via natural degradation processes. In the processing-storage-distribution sequence, opportunities exist for food to become contaminated by microorganisms that may seriously impair the quality, shelf life, or safety of such foods. Although much is known and is being utilized to protect our foodstuffs from such adverse influences, research is needed to develop additional and/or more economical effective means for maintaining quality and safety of food during processing and marketing.

## Objectives

A. Develop new or improved practical techniques for the maintenance of quality and safety of processed foods during manufacture, storage, and distribution.

B. Expand our basic knowledge regarding the effect of the macroenvironment and microenvironment on the physical, chemical, and microbiological properties of processed foods that affect their quality, safety, and consumer acceptance.

## Research Approaches

A. (1) Develop techniques to reduce or eliminate microorganisms that contribute to food spoilage or degradation.

(2) Develop new and improved packaging systems to control microorganisms, insect and rodent damage, and other changes related to package failure and food-package interactions.

(3) Optimize the use of food additives consistent with functionality and safety to maintain and protect product quality.

- B. (1) Expand basic studies on microbial spoilage and degradation of food products.  
 (2) Develop improved techniques for evaluating and monitoring quality and safety of foods during processing and distribution.  
 (3) Study kinetics, mechanics, and methods for controlling detrimental chemical and physical changes in foods such as enzymatic and protein changes, starch retrogradation, lipid oxidation, food component interactions, and color and texture changes.  
 (4) Expand our knowledge regarding mechanism of action of physical environmental factors such as temperature, gas atmospheres, and moisture, on the sensory attributes, stability, nutritive value, and safety of foods.

## Classification Guidelines\*

### Research Problem Areas

RPA 318, 404, 408, 412, 701, and 702

### Commodities

0600	0800	0900	1000	1100	1200
1400	1500	1600	1700	1800	2000
2200	2300	2400	2500	2700	2800
2900	3000	3100	3200	3300	3500
3800	6700	6800			

\* Manual of Classification of Agricultural and Forestry Research—Revision II

## PROBLEM AREA IV

### Food Acceptance and Consumption

Research Problem Area	Priority (1-4)	Current	Number of Scientific Man Years (SMYs)		
			No Increase	10% Increase	Recommended Total
IV	2	29.6	30.8	32.9	50.0

## Situation

The reasons for consumer preference for certain foods are often obscure and complex. Many variables are involved when people make their food choices. Often these reasons are attributed to factors other than nutritional adequacy. The consequences of nutritional inadequacy throughout

one's life span are serious, yet they exist to some extent in many segments of the population. To alleviate the problem, it would be necessary to motivate people to change food habits where needed. This could be accomplished by means of educational and other programs. However, implementation of such programs depends upon availability of

information on nutritional status or adequacy among various segments of the population, as related to food acceptance and consumption patterns. Research in this area would provide information useful for this purpose.

### Objective

- A. Determine the factors (including socio-economic conditions) influencing the selection, acceptability, and consumption of foods in an attempt to improve the eating habits and nutritional status of the consumer.

### Research Approaches

- A. (1) Food choice habits and patterns will be determined by studies of psychological, sociological, physiological, and economic factors which may influence them.  
(2) Food choice patterns among groups will be determined (fresh, frozen, dried, canned, fermented, engineered food, etc.).  
B. Food consumption patterns among groups will be determined with respect to food source

(horticultural crops, field crops, animal, dairy, seafood, or manufactured products).

C. Generate data banks from research studies, including and correlating the various aspects of flavor, color, appearance, and texture.

D. Develop procedures or criteria, providing background for educational programs to improve dietary patterns and nutritional status of consumers.

### Classification Guidelines\*

#### Research Problem Areas

RPA 318, 508, 601, 604, and 703

#### Commodities

0600	0800	0900	1000	1100	1200
1400	1500	1600	1700	1800	2000
2200	2300	2400	2500	2700	2800
2900	3000	3100	3200	3300	3500
3800	4000	4100	6700	6800	

\* Manual of Classification of Agricultural and Forestry Research—Revision II

## PROBLEM AREA V

### Storage, Distribution, and Marketing Systems for Food

Research Problem Area	Priority (1-4)	Current	Number of Scientific Man Years (SMYs)		
			No Increase	10% Increase	Recommended Total
V	3	37.2	34.4	37.2	45.0

### Situation

Existing methods for storage, distribution, and marketing of foods are often (1) inefficient, resulting in waste of energy and other resources, and (2) ineffective in providing optimum postharvest environments, resulting in deterioration of quality. Current systems evolved out of the need to utilize available equipment and technology, with little thought given to the possibility of entirely new concepts of storing, handling and transporting food products. Far-reaching concepts, utilizing newly envisioned technology, such as rapid-transit systems or other forms of surface transportation, could have a significant impact upon food distribution and marketing. New technology in this area could result in reduced handling costs and improved product environment. Information for a systems approach would be valuable for this purpose.

### Objectives

- A. Investigate methods for improving systems for storing, distributing, and marketing food.  
B. Develop economic data to compare existing methods with newly envisioned methods.

C. Provide design criteria for new technology as might be feasible.

### Research Approaches

A. Conduct a systems analysis study, involving all aspects of transporting and distributing food by truck, mail, boat, air, or combinations of these.

B. Compare economics of existing methods with new concepts as envisioned: this would include entirely new concepts for rapid transit by various means.

C. Develop design criteria for improved technology in handling and packaging techniques, as required for transporting to both domestic and international markets.

D. Explore techniques to provide environments for maximum quality maintenance during storage and transport of foods.

E. Conduct studies to determine relative economics of food handling in terms of food nutrients rather than food type.

F. Consider possible need and use of International Standards of Quality Control (Codex Alimentarius).



G. Compare efficiencies of storing, distributing, handling, and marketing foods in different forms, e.g., compacting or concentrating products versus fresh or canned.

#### Classification Guidelines\*

##### *Research Problem Areas*

RPA 318, 404, 408, 412, 503, 506, 507, 508, 509, 601, and 604

##### *Commodities*

0600	0800	0900	1000	1100	1200
1400	1500	1600	1700	1800	2000
2200	2300	2400	2500	2700	2800
2900	3000	3100	3200	3300	3500
3800	4000	4100	4400	4500	4700
4800	6700	6800			

\* Manual of Classification of Agricultural and Forestry Research—Revision II

## PROBLEM AREA VI

### Evaluation and Maintenance of Nutritive Values of Foods

Research Problem Area	Priority (1-4)	Current	Number of Scientific Man Years (SMYs)		
			No Increase	10% Increase	Recommended Total
VI	1	34.1	36.1	39.0	60.0

#### Situation

The primary purpose of food is to supply people with the nutrients required for normal body functions. There is more interest in the nutritive value of food among consumers today than in any previous period. Regulations have been promulgated that require detailed nutrient listing on those foods available in the marketplace for which nutritional claims are made. Thus, food processors need to know more about the nutritive value of raw foods and food ingredients, what happens to the nutrients during processing, storage, and distribution, and what nutrients are available in foods at the time of delivery and consumption.

In addition to the common food nutrients, the fiber content or bulk value of food is becoming of greater importance. Other properties of foods, such as flatulence, antinutritional factors, and the influence of food on intestinal microflora must be determined with respect to the influence on nutrition and the quality characteristics of food.

Research should be conducted to elucidate the role of composition and other food properties in human nutrition. The food scientists must use chemical, microbiological, biological (animals), and other tests to determine the composition and efficacy of nutrients in foods. When the problems deal with clinical nutrition, these are not considered to be the responsibility of food science and technology.

#### Objectives

- Develop and improve techniques for the determination of the nutritive content and value of foods.
- Evaluate the nutritive content and value of

raw and processed foods, food ingredients, and food combinations.

C. Determine the effects of processing, storage, and distribution on the nutritive value of various foods, compatible with other desirable quality characteristics.

D. Investigate the problem of nutrient alteration of foods through formulation, enrichment, and fortification.

#### Research Approaches

A. Methodology should be improved and simplified for the determination of nutrients in food products, particularly micronutrients.

B. More information should be developed on the quantity and quality of nutrients in raw and processed foods, food ingredients, and food combinations. Additional information is needed relative to unique interactions among nutrients from different sources that exert effects on the nutritive value of foods.

C. Much is known about the effects of processing, storage, and distribution on the nutritive value of foods. However, as new and improved processes, packages, and systems of handling food are developed, these three need to be evaluated for their effects on the nutritive value of foods.

D. Advancements in food science and technology have made it possible to fabricate new foods in terms of composition or nutrient content and physical state. Refinement processes involved in separating and purifying ingredients can remove macroconstituents and microconstituents that are associated with the original raw material. Also, processes that may be used to

alter physical characteristics can change the potential nutritive benefits. Thus, it becomes mandatory that knowledge be obtained about the nutritive value of "new foods" that are designed and fabricated for human consumption.

#### Classification Guidelines\*

##### *Research Problem Areas*

RPA 318, 403, 404, 406, 408, 410, 412, and 708

##### *Commodities*

0600	0800	0900	1000	1100	1200
1400	1500	1600	1700	1800	2000
2200	2300	2400	2500	2700	2800
2900	3000	3100	3200	3300	3500
3800	4000	4100	6700	6800	

\* Manual of classification of Agricultural and Forestry Research—Revision II

### PROBLEM AREA VII

#### Processing, Preparation, and Delivery of Foods for Convenience or Institutional Use

Research Problem Area	Priority (1-4)	Current	No Increase	Number of Scientific Man Years (SMYs)	
				10% Increase	Recommended Total
VII	2	4.5	5.7	7.8	20.0

#### Situation

Technological advances and simultaneous changes in lifestyle (1) have resulted in an increase in the use of convenience foods and (2) have resulted in a large food service industry serving retail and commercial outlets. This is evidenced by the growth in food vending, quick-food outlets, and centralized and decentralized food preparation for individual and institutional use. This industry has experienced rapid growth and, as a consequence, many of its problems have not been dealt with adequately. Among the problems facing this industry are maintenance of organoleptic quality, retention of nutrients, microbial contamination, methods of preservation and preparation, costs, packaging, and delivery systems.

#### Objectives

- Determine processing, preparation, and delivery conditions to ensure microbial safety of food consumed, to meet microbial standards for sanitation, and to prevent spoilage.
- Determine optimum conditions of processing, preparation and delivery of food to ensure the maintenance of optimum nutrient content.
- Determine conditions of processing, preparation, and delivery to optimize desirable sensory characteristics.
- Determine the economics of various systems of food processing, preparation, and delivery.

#### Research Approaches

- Determine the characteristics of the initial microbial flora of foodstuffs, with special attention to pathogens, and the relationship of this

flora to subsequent growth of micro-organisms as influenced by time, temperature, and other environmental conditions.

B. Determine changes in nutrient content of foods, as affected by conditions of processing, packaging, preparation, and delivery. Special attention will be paid to factors, such as pH, enzymes, light, temperature, chelates, and holding and storage times.

C. Evaluate and control the sensory characteristics of foods as affected by methods of preparation, preservation (i.e., freezing, thermal processing, and preservatives) and serving.

D. Evaluate the effect of unit size (number of people to be served), feasibility of the application of computer technology, availability and cost of transportation, availability and competence of labor, characteristics of and cost of equipment or the cost of developing needed equipment, and capital requirements on the comparative cost relationships of existing feeding systems.

#### Classification Guidelines\*

##### *Research Problem Areas*

RPA 318, 403, 406, 410, 702, 703, and 704

##### *Commodities*

0600	0800	0900	1000	1100	1200
1400	1500	1600	1700	1800	2000
2200	2300	2400	2500	2700	2800
2900	3000	3100	3200	3300	3500
3800	4000	4100	6700	6800	

\* Manual of Classification of Agricultural Forestry Research—Revision II



## PROBLEM AREA VIII

### Energy, Water, and Waste Management in Food Handling and Processing

Research Problem Area	Priority (1-4)	Current	No Increase	Number of Scientific Man Years (SMYs)	
				10% Increase	Recommended Total
VIII	1	8.0	10.2	12.9	25.0

#### Situation

The increasing demands and resulting dwindling sources of energy and clean water, coupled with the concern for environmental quality, pose serious challenges to the food processor and problems for the consumer. Ecological, economic, and sociological pressures are forcing processors to effect reductions in the use of water, in the volume and strength of effluents, and in the utilization of energy. These are major complex problems of concern to the food processor, particularly since actions taken to alleviate one of the problems may concomitantly result in aggravating the seriousness of another.

#### Objectives

- A. Optimize the utilization of current energy sources and devise means whereby alternate energy sources can be used in the processing, storage, and distribution of foods.
- B. Optimize the efficiency of water utilization in the manufacture of processed foods.
- C. Develop food-processing technology that will reduce harmful effects on people and the environment.

#### Research Approaches

- A. (1) Develop low-energy food processing, storage, and distribution schemes.
- (2) Modify processing procedures to reduce peak load demands.
- (3) Revise energy recycling processes for food manufacture.
- (4) Develop means for increasing flexibility of energy source utilization.
- (5) Explore utilization of alternate sources of energy, e.g., solar and nuclear energy.
- (6) Study the feasibility of using waste products as fuel.

(7) Evaluate the economic effects of implementing energy conservation and production practices in food processing.

- B. (1) Develop technology for minimizing the amount of water used in all food-processing operations, i.e., cleaning and conveying.
- (2) Devise practical efficient water recycling systems.
- (3) Study the economics of water sources, treatment, and the use and reuse in food processing.
- (4) Develop alternatives to water use in processing of foods, e.g., pneumatic conveying, air cooling, and ultrasonic cleaning.
- C. (1) Develop new feed, food, and industrial products from food processing wastes.
- (2) Develop new and efficient methods and equipment for the collection, treatment, and disposal of food processing wastes.
- (3) Develop new or modify existing food processes that will result in minimal adverse effects on people and the environment. Emphasize methods that will reduce off odors, dust, smoke, toxic compounds, microorganisms, and noise.
- (4) Study the economics of waste disposal treatments and practices in food processing.

#### Classification Guidelines\*

*Research Problem Area*

RPA 901

*Commodities*

0200	0600	0800	0900	1000	1100
1200	1400	1500	1600	1700	1800
2000	2200	2300	2400	2500	2700
2800	2900	3000	3100	3200	3300
3500	3800	6700	6800		

\* Manual of Classification of Agricultural and Forestry Research—Revision II

## PROBLEM AREA IX

### Methodology and Assessment of Quality Attributes for Grades and Standards of Foods

Research Problem Area	Priority (1-4)	Current	No Increase	Number of Scientific Man Years (SMYs)	
				10% Increase	Recommended Total
IX	2	23.3	24.5	26.6	40.0



## Situation

Food industries are confronted with an ever-increasing number of regulations concerning the processing, handling, preserving, packaging, and distributing of foods. Regulations should be based on the best scientific knowledge. Therefore, continuous research is necessary to ascertain the effects of each regulation and guideline on the production of food to assure that each product is nutritious, safe, and wholesome.

## Objectives

- A. Develop rapid chemical, physical, and biological methodology for objective assessment of quality, including color, flavor, texture, and nutritive value.
- B. Evaluate and/or translate grades and standards in terms of their relation and value to their ultimate use by the consumer.
- C. Develop useful, accurate, and reliable information relative to nutritional characteristics of foods.
- D. Develop useful information for industry, state, and federal agencies compatible with contemporary handling, packaging, and distribution.
- E. Develop new and/or improved methodology for rapid determination of pesticides and other contaminants.

## Research Approaches

Major emphasis will be concentrated in providing meaningful standards for food marketed in the United States. However, in light of our ever-increasing global commitments, special effort will be made to minimize problems arising when U.S. products are exported to countries where standards vary from ours and/or in countries without adequate food laws.

- A. Research will be undertaken to evaluate and develop rapid objective techniques to determine quality attributes of the various classes of raw and processed foods, including the conventional single commodities, fabricated foods, and commodity mixtures.

B. Both existing and newly developed standards will be evaluated by sensory panels, preparatory to recommendations regarding use and implementation. These studies will be designed to gain data so that it will be possible to translate subjective grades into objective attribute levels based on utilization requirements and consumer needs.

C. In each of the various food classes, studies will be undertaken to determine nutritional characteristics, including toxicological aspects. Experimental techniques will be designed to uncover sources and ranges of nutrient variance within each commodity, at both the wholesale and consumption levels, so that the uses and/or limitations of nutritional labeling will be based on factual scientific guidance.

D. Conduct cooperative studies with industry and regulatory agencies to examine the value and feasibility of existing, new and/or improved grades and standards prior to their implementation. These pilot studies will be conducted on such a scale that would determine the applicability of a given standard to the various stages of the marketing process.

E. Conduct research to develop better ways to monitor pesticides and other contaminants of food. These studies will also monitor the levels of these contaminants and/or their degradation products at the raw, processed, and/or utilization levels.

## Classification Guidelines\*

### Research Problem Areas

RPA 318, 404, 408, 412, and 501

### Commodities

0600	0800	0900	1000	1100	1200
1400	1500	1600	1700	1800	2000
2200	2300	2400	2500	2700	2800
2900	3000	3100	3200	3300	3500
3800	6700	6800	7000		

\* Manual of Classification of Agricultural and Forestry Research—Revision II

## PROBLEM AREA X

### Assessment of Effects of Science and Technology of Food on Health, Environment, and Socioeconomic Factors

Research Problem Area	Priority (1-4)	Current	Number of Scientific Man Years (SMYs)		
			No Increase	10% Increase	Recommended Total
X	2	2.2	3.4	5.5	15.0

## Situation

The increasing demand for foods in greater variety and products that meet special needs are responsible for the rapid introduction of new foods. Scientific and technological developments, and political and economic factors have provided the food industry information and incentives to bring about new production and manufacturing practices. These have marked long-term effects on (1) the environment and related pollution problems, (2) the health and life-expectancy of consumers, and (3) the economic development and growth of agribusiness and related industries. Very little attention has been given to the prediction and evaluation of such long-term effects. These effects can no longer be ignored and there is an increased need for better planning and a greater appreciation of the influence of the introduction of new foods on nutrition, health, the environment, and socioeconomic factors.

## Objectives

- A. Determine the long-term effects of new foods, products, and production and manufacturing practices on the environment and the health, safety, nutrition, and sociological patterns of consumers.
- B. Evaluate and recommend procedures to cope with any potential adverse effects of such new developments.

## Research Approaches

- A. Develop needed methodology for the evalua-

tion of long-term effects of changing dietary patterns and environmental factors related to food developments.

- B. Determine the effect of new production, manufacturing, packaging, and distribution methods on the environment, health, and safety.
- C. Perform biological assessment of long-term toxicological or nutritive effects of new foods and food components.
- D. Determine the influence of new food products and processes on dietary patterns of consumers and related sociological and economic aspects.
- E. Develop alternative products and procedures to avoid or minimize potentially dangerous long-term effects.
- F. Study and recommend ways to (1) improve international distribution of foods, (2) predict success potential for alternative systems and (3) predict effects on various countries or population groups, including those unprotected by Regulatory Agencies.

## Classification Guidelines\*

### Research Problem Areas

#### RPA 806 and 807

#### *Commodities*

3800	4000	4100	4200	4300	4400
4600	4700	4800			

\* Manual of Classification of Agricultural and Forestry Research—Revision II



## General Summary

The supply, safety, and cost of food are of increasing concern to consumers. Although food is produced, processed, and distributed in the United States for a smaller percentage of the consumers' income after taxes (about 17 percent) than in any country in the world, marketing margins are tending upward and are becoming of greater importance in the total cost of food. Science and technology have played a significant role in attaining the current level of performance of the food industry. To protect and sustain this level of efficiency, an adequate research program must be devoted to solving the problems associated with the processing, distribution and acceptance of food.

Several of the task forces, established by the Southern Regional Agricultural Research Planning Committee, have recognized the need for expanded research in the food marketing sector. However, the Food Processing, Distribution, and Acceptance Task Force was given the specific assignment to review the present status of research, to identify needs and to recommend required action. A summary of task force findings follows.

- To properly identify, assess, and develop this important area of work into an integrated whole, a Research Program Group (RPG) entitled *Food* should be established.

- The food business, a major source of economic growth in the Southern Region, consists of some 130,035 establishments with 1,481,200 employees and total sales in excess of \$56 billion. While the food industry is sizable in the aggregate, it is comprised of a large number of small businesses, most of which are unable to support research programs. Thus, it is in the public interest to expand food research.

- Immediate, increased emphasis should be given food processing, distribution, and acceptance research. However, this emphasis should be coordinated with ongoing research, and full advantage should be taken of interaction and planning with other groups, disciplines, and scientists. A multidisciplinary or total systems approach often proves most efficient.

- Responsibility for food research is shared by university, government, and industry scientists. Careful examination and delineation of the roles of each must be combined with joint planning so as to maximize the use of limited resources and to exploit the unique interests, qualifications and capabilities of government, university, and industry scientists.

- The scope of the present research effort on

food processing, distribution, and acceptance does not match the scope of the need. Examination of summary Tables 1 and 8 reveals that when the current program of research is broken into 10 important problem areas and evaluated from the standpoint of level of effort and needs, an expansion of from 327.5 scientific man-years (SMYs) to 500 SMYs or an overall increase of 53 percent is required to solve current problems. Closer inspection of Table 1 shows that when priority or urgency of problem and current level of effort are taken into account by problem area recommended percentage increases in program range from 2.6 to 582 percent.

- Detailed information, relating to size and kind of food businesses, wholesale food businesses, retail food stores, and eating and drinking places, is summarized for the Southern Region in Tables 2 to 7 and State summaries may be found in the Appendix. When these measures are considered, the need to substantially increase the research level becomes even more apparent.

- In fiscal year 1973, resources amounting to 3,162 SMYs or \$196,600,000 were expended for research in the Southern Region by the SAES, USDA, and the Colleges of 1890. Thus, the 327 SMYs devoted to Food Processing, Distribution, and Acceptance research is about 10.4 percent of the total research effort and is about \$20,446,400.

- Frequently the ratio of dollars spent for research and development (R & D) to sales dollars is a useful measure of the R & D effort and is sometimes used to determine whether the R & D budget is in line with other areas. For example,<sup>1</sup> the funds for R & D performance as a percent of net sales in R & D performing manufacturing companies for 1968 indicates 0.4 for the food and kindred products. Total sales of the food industry of the region is in excess of \$56.2 billion. When the figure is related to public dollars expended for research, the result is a paltry 0.036 percent. This is obviously inadequate by any measure.

This report has been prepared on the premise that (1) it is in the public interest to maintain an adequate program of research on problems of importance to the food industry and consumers; (2) those responsible for planning and directing research will be made aware of the needs; and (3) advantage will be taken of cooperative planning and coordination of research as a means for maximizing the use of limited resources.

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<sup>1</sup> National Science Foundation NSF 70-29. Research and Development in Industry 1968 (Jan. 1971 p. 61).

# Food Processing, Distribution, and Acceptance Planning Committee and Task Force

## Administrative Advisors

*Mr. J. C. Williamson, Jr.*  
Director of Research  
North Carolina State University  
Raleigh, NC 27607

*Dr. C. H. H. Neufeld*  
Area Director, Athens, Georgia Area  
Agricultural Research Service  
P. O. Box 5677  
Athens, GA 30604

## Steering Committee

Dr. R. A. Dennison, Chairman  
Dr. G. R. Ammerman  
Dr. D. C. Cooksey  
Dr. G. G. Dull  
Dr. G. G. Garner

Dr. R. V. Lechowich  
Dr. C. H. H. Neufeld  
Dr. W. M. Roberts  
Dr. C. J. B. Smit  
Mr. J. C. Williamson, Jr.

## Members

*Dr. G. R. Ammerman*  
Food Research Institute  
Horticultural Department  
Mississippi State University  
St. College, MS 39762

*Dr. J. C. Ayres*  
Department of Food Science  
University of Georgia  
Athens, GA 30602

*Dr. R. P. Bates*  
Food Science Department  
University of Florida  
Gainesville, FL 32611

*Mr. A. H. Bennett*  
USDA—ARS  
Russell Research Center  
P. O. Box 5677  
Athens, GA 30604

*Dr. Robert E. Berry*  
USDA—ARS  
Citrus and Subtropical Products Lab  
Winter Haven, FL 33880

*Dr. R. J. Cannon*  
Department of Animal & Dairy Science  
Auburn University  
Auburn, AL 36830

*Dr. R. A. Chung*  
Department of Food Science  
Tuskegee Institute  
Tuskegee, AL 36088

*Dr. D. C. Cooksey*  
School of Home Economics  
Prairie View A & M College  
Prairie View, TX 77445

*Dr. Robert Davis*  
USDA—ARS  
Stored Products Insects  
R & D Laboratory  
Savannah, GA 31402

*Dr. R. A. Dennison*  
Food Science Department  
University of Florida  
Gainesville, FL 32611

*Mr. F. G. Dollear*  
USDA—ARS  
Southern Region Research Center  
P. O. Box 19687  
New Orleans, LA 70179

*Dr. G. G. Dull*  
USDA—ARS  
Russell Research Center  
P. O. Box 5677  
Athens, GA 30604

*Dr. C. L. Ellison\**  
Fort Valley State College  
Fort Valley, GA 31030

*Dr. R. G. Garner*  
USDA—CSRS  
Food Science Programs  
Washington, DC 20250

*Ms. Nannie Goines*  
Virginia State College  
Petersburg, VA 23803

*Dr. Miguel A. Gonzalez*  
Food Technology Laboratory  
Agricultural Experiment Station  
University of Puerto Rico  
Mayaguez, PR 00708

*Dr. T. T. Hatton, Jr.*  
USDA—ARS  
2120 Camden Road  
Orlando, FL 32803

*Dr. R. L. Henrickson*  
Animal Science Department  
Oklahoma State University  
Stillwater, OK 74074

---

\* Deceased

*Dr. Charles E. Holoday*  
USDA—ARS  
National Peanut Research Center  
Dawson, GA 31742

*Dr. Dale L. Huffman*  
Animal Science Department  
Auburn University  
Auburn, AL 36830

*Dr. A. A. Kattan*  
Department of  
Horticultural Food Science  
University of Arkansas  
Fayetteville, AR 72701

*Dr. Bruce E. Langlois*  
Department of Animal Science  
University of Kentucky  
Lexington, KY 40506

*Dr. R. V. Lechowich*  
Department of  
Food Science and Technology  
Virginia Polytechnic Institute  
Blacksburg, VA 24061

*Mr. Bruce J. Lime*  
USDA—ARS  
Food Crops Utilization  
Weslaco, TX 78596

*Dr. Kailash Mathur*  
South Carolina State College  
Orangeburg, SC 29115

*Dr. A. J. Mercuri*  
USDA—ARS  
Russell Research Center  
P. O. Box 5677  
Athens, GA 30604

*Dr. J. T. Miles*  
Department of  
Food Technology and Science  
University of Tennessee  
Knoxville, TN 37901

*Dr. Art Novak*  
Food Science Department  
Louisiana State University  
Baton Rouge, LA 70803

*Dr. Johnnie Prothro*  
Home Economics Department  
Tuskegee Institute  
Tuskegee, AL 36088

*Dr. H. E. Randolph*  
Department of Animal Science  
Texas A & M University  
College Station, TX 77843

*Dr. W. M. Roberts*  
Food Science Department  
North Carolina State University  
Raleigh, NC 27607

*Dr. C. W. Seo*  
Home Economics Department  
North Carolina Agricultural and  
Technical State University  
Greensboro, N. C. 27411

*Dr. C. J. B. Smit*  
Department of Food Science  
University of Georgia  
Athens, GA 30602

*Dr. R. T. Toledo*  
Department of Food Science  
University of Georgia  
Athens, GA 30602

*Dr. Woodie Williams*  
Food Science Department  
Clemson University  
Clemson, SC 29631



# APPENDIX 1

## General Statistics for States by Industry Groups and Industries: 1972 and 1967

1972 CENSUS OF MANUFACTURES

Code		Industry	1972										1967		
			Establishments		All employees		Production workers			Value added by manufacture	Cost of materials <sup>1</sup>	Value of shipments <sup>1</sup>	Capital expenditures, new	All employees	Value added by manufacture
			Total	With 20 employees or more	Number	Payroll	Number	Man-hours	Wages						
			(number)	(number)	(1,000)	(million dollars)	(1,000)	(million)	(million dollars)	(million dollars)	(million dollars)	(million dollars)	(1,000)	(million dollars)	
Alabama															
20		FOOD AND KINDRED PRODUCTS. . . .	415	191	24.6	158.8	16.2	33.0	85.7	361.6	986.1	1 343.0	24.4	23.6	261.6
201		MEAT PRODUCTS. . . . .	86	42	9.4	52.7	8.4	16.9	43.0	92.5	377.9	470.5	5.8	7.6	61.3
2011		MEATPACKING PLANTS. . . . .	44	14	2.1	17.0	1.7	3.5	11.8	30.9	107.9	139.3	1.5	2.3	19.0
2016		POULTRY DRESSING PLANTS. . . . .	27	23	6.7	32.5	6.3	12.7	29.1	57.5	244.4	301.5	4.0	(NA)	(NA)
*202		DAIRY PRODUCTS. . . . .	46	27	3.5	25.3	1.2	2.3	6.3	45.5	125.2	171.0	4.2	3.9	45.2
2024		ICE CREAM AND FROZEN DESSERTS. . . .	7	4	.5	3.8	.2	.4	1.5	7.5	16.1	23.8	.3	.4	4.8
2026		FLUID MILK. . . . .	33	23	3.0	21.2	.9	1.9	4.7	37.0	106.5	143.7	3.8	3.4	39.9
*203		PRESERVED FRUITS AND VEGETABLES. . .	13	10	1.4	6.8	1.1	2.1	4.5	21.7	39.2	61.0	1.5	(NA)	(NA)
2035		PICKLES, SAUCES, AND SALAD DRESSINGS	5	4	.4	2.4	.3	.7	1.6	8.5	15.6	24.1	.5	.4	4.6
*204		GRAIN MILL PRODUCTS. . . . .	79	17	1.8	15.0	1.1	2.6	7.4	45.9	216.6	262.0	2.5	1.8	38.0
*205		BAKERY PRODUCTS. . . . .	38	21	2.8	22.0	1.5	3.1	9.6	47.3	34.7	82.0	3.8	3.6	36.2
*206		SUGAR AND CONFECTIONERY PRODUCTS. .	10	5	.5	2.5	.5	.9	2.1	10.9	22.9	31.8	.5	(NA)	(NA)
2065		CONFECTIONERY PRODUCTS. . . . .	9	4	.5	2.5	.5	.9	2.1	10.9	22.9	31.8	.5	CC	(D)
*207		FATS AND OILS. . . . .	20	14	.8	5.7	.7	1.5	4.1	18.0	78.2	93.7	1.1	(NA)	(NA)
2077		ANIMAL AND MARINE FATS AND OILS. . .	10	6	.3	1.7	.2	.4	1.0	5.2	7.4	12.5	.4	.2	3.1
*208		BEVERAGES. . . . .	59	42	2.9	19.1	.9	2.1	5.1	57.8	57.0	114.6	3.1	2.9	34.4
*209		MISC. FOODS AND KINDRED PRODUCTS. .	64	13	1.5	9.6	.8	1.5	3.6	22.0	34.3	56.4	1.8	(NA)	(NA)
2099		FOOD PREPARATIONS, NEC. . . . .	23	7	1.0	6.7	.5	.8	2.3	15.1	18.3	33.4	1.0	.8	12.9

## Arkansas

20	FOOD AND KINDRED PRODUCTS. . . . .	338	174	24.8	139.9	19.6	40.6	97.0	353.7	1 221.2	1 564.7	28.5	21.5	262.8
201	MEAT PRODUCTS. . . . .	83	47	10.0	49.9	9.3	19.5	43.9	84.0	354.2	440.7	9.2	8.5	60.4
2011	MEATPACKING PLANTS. . . . .	41	13	1.1	7.0	.9	2.0	5.3	9.6	72.2	81.6	.9	CC	(D)
2016	POULTRY DRESSING PLANTS. . . . .	35	30	8.5	40.8	8.0	16.7	36.9	71.0	267.1	340.6	7.7	(NA)	(NA)
202	DAIRY PRODUCTS. . . . .	27	15	1.1	7.9	.5	1.0	3.1	18.9	55.3	75.2	1.6	1.4	16.8
2026	FLUID MILK. . . . .	15	9	.7	5.4	.3	.5	1.9	15.4	35.5	50.7	.9	.8	9.9
203	PRESERVED FRUITS AND VEGETABLES. . . . .	25	21	5.6	28.5	4.9	9.2	22.1	100.3	160.6	260.3	5.5	(NA)	(NA)
2033	CANNED FRUITS AND VEGETABLES. . . . .	12	10	1.7	7.5	1.5	2.6	5.6	21.9	36.8	58.7	2.5	1.2	7.6
2038	FROZEN SPECIALTIES. . . . .	6	5	2.7	14.4	2.4	4.7	11.9	44.4	79.2	123.0	1.5	(NA)	(NA)
204	GRAIN MILL PRODUCTS. . . . .	65	26	2.4	14.3	1.6	3.7	8.8	41.9	341.5	381.8	5.1	2.2	47.7
205	BAKERY PRODUCTS. . . . .	23	14	1.8	15.2	1.0	2.2	7.4	31.3	30.3	61.6	2.0	2.0	27.9
207	FATS AND OILS. . . . .	23	19	1.5	9.4	1.2	2.9	7.0	44.8	244.4	277.8	2.8	(NA)	(NA)
2074	COTTONSEED OIL MILLS. . . . .	9	8	.6	3.5	.5	1.2	2.5	11.3	46.6	55.4	.9	BB	(D)
208	BEVERAGES. . . . .	52	26	2.0	12.6	.7	1.5	3.5	27.5	28.5	55.6	1.7	EE	(D)

## Florida

20	FOOD AND KINDRED PRODUCTS. . . . .	793	333	48.4	331.2	30.2	65.7	193.0	773.2	2 103.6	3 062.5	77.0	44.3	627.2
201	MEAT PRODUCTS. . . . .	84	35	5.1	35.0	3.9	8.4	24.2	81.1	331.4	407.1	4.5	4.9	50.0
2011	MEATPACKING PLANTS. . . . .	38	15	1.7	13.8	1.2	2.8	8.2	28.8	176.1	202.6	1.9	1.7	21.7
2013	SAUSAGES AND OTHER PREPARED MEATS. . . . .	39	15	1.9	13.7	1.4	2.9	9.6	30.0	129.6	156.5	1.9	1.7	16.3
202	DAIRY PRODUCTS. . . . .	74	45	4.8	40.4	2.0	4.5	15.3	109.0	248.5	357.3	6.7	5.5	88.6
2024	ICE CREAM AND FROZEN DESSERTS. . . . .	22	7	.6	4.8	.4	.8	2.5	14.4	20.9	35.2	1.2	.7	8.7
2026	FLUID MILK. . . . .	47	38	4.1	35.4	1.6	3.7	12.7	94.1	229.4	319.3	5.5	4.7	79.3
203	PRESERVED FRUITS AND VEGETABLES. . . . .	116	57	12.3	94.2	10.2	23.6	63.6	276.8	699.5	961.6	29.5	(NA)	(NA)
2033	CANNED FRUITS AND VEGETABLES. . . . .	56	24	5.0	31.1	4.1	9.7	23.2	90.5	186.0	275.0	10.9	7.7	88.8
2038	FROZEN SPECIALTIES. . . . .	18	6	.6	5.1	.5	1.0	3.6	14.6	38.5	53.1	1.7	(NA)	(NA)
204	GRAIN MILL PRODUCTS. . . . .	60	18	1.3	8.3	.7	1.5	4.4	20.1	87.8	107.8	1.3	.9	13.4
205	BAKERY PRODUCTS. . . . .	110	41	6.2	48.2	3.6	7.4	25.1	95.7	79.7	175.5	6.7	5.9	65.1
206	SUGAR AND CONFECTIONERY PRODUCTS. . . . .	32	15	2.2	21.7	1.6	3.9	16.3	66.1	119.3	179.1	9.9	(NA)	(NA)
2061	RAW CANE SUGAR. . . . .	9	7	1.4	14.9	1.0	2.6	12.0	44.5	69.0	111.3	8.1	EE	(D)
2062	CANE SUGAR REFINING. . . . .	3	3	.3	4.6	.3	.7	2.9	14.9	44.6	55.0	1.5	AA	(D)
2065	CONFECTIONERY PRODUCTS. . . . .	20	5	.5	2.3	.3	.6	1.4	6.7	5.8	12.8	.3	.4	4.2
207	FATS AND OILS. . . . .	15	8	.3	3.4	.2	.6	1.8	14.3	15.0	28.4	2.1	(NA)	(NA)
2077	ANIMAL AND MARINE FATS AND OILS. . . . .	9	7	.3	3.0	.2	.4	1.5	11.2	6.5	17.6	1.9	.3	5.0
208	BEVERAGES. . . . .	105	62	5.6	50.5	2.7	5.6	22.2	156.6	240.4	394.5	9.3	5.7	93.6
2086	BOTTLED AND CANNED SOFT DRINKS. . . . .	82	51	4.1	32.0	1.5	3.2	9.2	76.1	122.5	198.5	6.1	4.8	62.3
2087	FLAVORING EXTRACTS AND SYRUPS, NEC. . . . .	11	3	.3	2.2	.2	.6	1.6	17.8	18.1	35.2	.3	(NA)	(NA)
209	MISC. FOODS AND KINDRED PRODUCTS. . . . .	197	52	6.5	39.4	5.3	10.4	26.1	153.6	297.0	451.4	8.4	(NA)	(NA)
2092	FRESH OR FROZEN PACKAGED FISH. . . . .	41	20	3.7	18.5	3.3	6.5	12.7	35.8	106.1	141.7	1.3	2.7	13.6
2095	ROASTED COFFEE. . . . .	21	7	1.0	9.8	.7	1.4	6.4	80.9	155.0	237.0	3.7	CC	(D)
2097	MANUFACTURED ICE. . . . .	61	6	.5	2.7	.3	.8	1.8	7.0	1.4	8.4	.8	.7	6.4
2099	FOOD PREPARATIONS, NEC. . . . .	61	17	1.2	7.7	.9	1.5	4.8	27.6	32.1	59.9	2.4	1.0	9.9

# APPENDIX 1 (continued)

## General Statistics for States by Industry Groups and Industries: 1972 and 1967

1972 CENSUS OF MANUFACTURES

Code	Industry	1972										1967		
		Establishments		All employees		Production workers			Value added by manufacture	Cost of materials¹	Value of shipments¹	Capital expenditures, new	All employees	Value added by manufacture
		Total	With 20 employees or more	Number	Payroll	Number	Man-hours	Wages						
		(number)	(number)	(1,000)	(million dollars)	(1,000)	(million)	(million dollars)	(million dollars)	(million dollars)	(million dollars)	(million dollars)	(1,000)	(million dollars)

## Georgia

20	FOOD AND KINDRED PRODUCTS. . . . .	661	293	45.4	305.6	32.0	64.8	182.3	822.1	1 799.0	2 612.3	56.2	45.7	557.4
201	MEAT PRODUCTS. . . . .	148	67	13.3	74.9	11.2	22.5	56.1	131.9	528.9	661.6	13.3	13.6	98.4
2011	MEATPACKING PLANTS. . . . .	83	26	3.5	23.6	2.5	5.5	15.1	39.8	224.9	263.9	3.3	3.2	29.5
2013	SAUSAGES AND OTHER PREPARED MEATS. . . . .	31	12	1.0	6.4	.7	1.2	3.6	13.7	54.5	68.3	1.6	.5	6.6
2016	POULTRY DRESSING PLANTS. . . . .	27	27	8.7	43.9	7.8	15.4	36.6	76.3	238.8	316.2	8.3	(NA)	(NA)
202	DAIRY PRODUCTS. . . . .	48	23	3.1	25.3	1.5	3.0	10.9	54.3	181.0	234.0	2.8	3.5	38.3
2026	FLUID MILK. . . . .	35	17	2.1	16.1	.8	1.5	4.6	38.1	78.7	116.8	1.1	FF	(0)
203	PRESERVED FRUITS AND VEGETABLES. . . . .	33	18	3.5	18.0	3.0	6.1	13.1	36.3	66.9	103.6	3.6	(NA)	(NA)
2033	CANNED FRUITS AND VEGETABLES. . . . .	12	7	1.3	5.5	1.1	2.0	4.3	10.7	21.2	32.2	.7	EE	(D)
2038	FROZEN SPECIALTIES. . . . .	9	5	.6	4.4	.5	.9	2.7	12.2	14.6	26.8	2.1	(NA)	(NA)
204	GRAIN MILL PRODUCTS. . . . .	120	28	2.4	17.9	1.6	3.3	9.7	57.8	251.8	308.6	3.6	2.0	40.5
205	BAKERY PRODUCTS. . . . .	60	35	8.2	65.7	5.7	11.6	39.9	172.2	141.0	313.1	(0)	7.7	119.8
2051	BREAD, CAKE, AND RELATED PRODUCTS. . . . .	50	27	4.5	37.8	2.6	5.7	17.1	74.8	62.4	137.3	6.5	4.6	60.7
206	SUGAR AND CONFECTIONERY PRODUCTS. . . . .	22	12	3.6	27.1	2.9	6.3	17.6	81.4	182.7	262.8	5.9	(NA)	(NA)
207	FATS AND OILS. . . . .	24	18	1.2	9.2	.9	2.0	6.0	45.0	196.4	234.4	6.3	(NA)	(NA)
2079	SHORTENING AND COOKING OILS. . . . .	5	5	.5	4.4	.4	.9	3.0	14.8	69.1	84.7	3.2	.6	14.4
208	BEVERAGES. . . . .	96	64	5.5	43.9	1.9	4.0	13.7	165.3	157.1	323.9	5.7	5.5	108.8
2086	BOTTLED AND CANNED SOFT DRINKS. . . . .	74	56	4.3	31.1	1.4	2.9	8.0	60.3	72.6	134.5	5.1	4.5	49.0
209	MISC. FOODS AND KINDRED PRODUCTS. . . . .	110	28	4.3	23.6	3.2	5.6	14.7	78.0	93.2	170.5	2.5	(NA)	(NA)
2092	FRESH OR FROZEN PACKAGED FISH. . . . .	15	7	1.5	6.2	1.3	2.3	4.3	12.3	33.1	45.3	.8	2.3	9.9
2099	FOOD PREPARATIONS, NEC. . . . .	49	20	2.5	16.0	1.7	3.0	9.6	60.4	56.0	115.8	1.5	2.5	30.6

## Kentucky

20	FOOD AND KINDRED PRODUCTS. . . . .	387	193	22.0	186.9	14.2	29.1	111.4	707.1	1 110.4	1 815.7	37.2	23.0	513.3
201	MEAT PRODUCTS. . . . .	72	17	3.1	27.4	2.3	5.0	19.9	57.0	228.6	284.8	3.5	3.1	37.7
2011	MEATPACKING PLANTS. . . . .	55	13	2.7	26.0	2.0	4.5	18.9	53.3	219.1	271.5	3.3	2.5	35.2
202	DAIRY PRODUCTS. . . . .	71	45	3.1	24.0	1.5	3.1	10.3	54.9	180.5	236.4	3.7	3.6	50.6
2022	CHEESE, NATURAL AND PROCESSED. . . . .	10	10	.4	2.3	.3	.5	1.6	7.1	24.4	31.5	.8	.5	3.8
2026	FLUID MILK. . . . .	43	25	2.0	16.4	.7	1.5	5.1	33.2	92.5	125.6	2.2	2.4	31.7
203	PRESERVED FRUITS AND VEGETABLES. . . . .	10	6	.6	4.2	.4	.8	2.4	10.1	16.0	26.1	1.1	(NA)	(NA)
204	GRAIN MILL PRODUCTS. . . . .	44	14	.8	6.1	.6	1.2	3.7	20.9	70.1	91.1	1.0	.8	17.6
205	BAKERY PRODUCTS. . . . .	31	15	2.5	22.1	1.6	3.3	11.3	43.0	44.9	87.9	1.6	2.7	31.1
207	FATS AND OILS. . . . .	7	4	.6	6.0	.4	1.0	3.7	19.3	149.0	168.3	.4	(NA)	(NA)
208	BEVERAGES. . . . .	96	78	9.7	86.2	6.3	12.7	53.2	466.1	382.2	807.1	21.2	10.5	338.8
2086	BOTTLED AND CANNED SOFT DRINKS. . . . .	58	41	3.1	23.6	1.1	2.4	6.8	56.9	76.9	133.5	11.6	2.7	34.6
209	MISC. FOODS AND KINDRED PRODUCTS. . . . .	41	13	1.4	10.5	.9	1.9	6.5	34.9	78.1	111.7	4.6	(NA)	(NA)
2099	FOOD PREPARATIONS, NEC. . . . .	24	11	.9	7.1	.6	1.2	4.2	23.2	40.1	62.2	2.3	.7	12.7

## Louisiana

20	FOOD AND KINDRED PRODUCTS. . . . .	551	234	28.7	202.1	18.9	40.0	113.7	584.3	1 374.0	1 973.4	40.9	29.6	455.0
201	MEAT PRODUCTS. . . . .	91	30	3.5	20.9	2.8	5.5	14.9	45.3	152.8	197.4	2.6	3.1	30.6
2011	MEATPACKING PLANTS. . . . .	62	14	1.0	6.8	.7	1.4	4.5	10.6	55.0	65.4	1.2	.9	13.8
2013	SAUSAGES AND OTHER PREPARED MEATS. . . . .	10	9	.7	6.7	.5	1.0	3.3	12.7	30.7	43.0	.7	.5	5.4
2016	POULTRY DRESSING PLANTS. . . . .	11	8	1.8	4.3	1.6	3.1	7.1	22.0	67.0	88.9	.7	(NA)	(NA)
202	DAIRY PRODUCTS. . . . .	58	32	2.9	22.4	1.1	2.2	6.8	57.6	154.5	211.7	4.5	2.9	42.5
2026	FLUID MILK. . . . .	43	25	2.5	19.8	.9	1.8	5.8	52.9	146.3	198.7	4.4	2.4	35.0
203	PRESERVED FRUITS AND VEGETABLES. . . . .	24	15	2.5	12.2	2.1	4.4	8.3	31.4	37.3	68.7	1.6	(NA)	(NA)
2033	CANNED FRUITS AND VEGETABLES. . . . .	15	9	1.5	6.9	1.3	3.0	5.6	14.9	22.3	37.2	1.0	1.7	11.5
204	GRAIN MILL PRODUCTS. . . . .	47	24	1.5	8.5	1.2	2.5	5.8	36.6	138.0	175.6	1.3	1.7	30.3
205	BAKERY PRODUCTS. . . . .	44	24	3.9	31.1	2.0	4.5	12.4	56.2	41.6	97.7	3.1	3.8	46.2
206	SUGAR AND CONFECTIONERY PRODUCTS. . . . .	59	46	5.1	42.6	4.1	10.0	33.6	114.2	413.5	522.6	14.3	(NA)	(NA)
207	FATS AND OILS. . . . .	23	15	1.1	8.0	.9	2.1	6.0	23.5	109.1	133.8	4.0	(NA)	(NA)
2079	ANIMAL AND MARINE FATS AND OILS. . . . .	11	8	.5	3.2	.4	1.0	2.7	12.7	9.2	21.5	1.0	.6	8.0
2079	SHORTENING AND COOKING OILS. . . . .	3	3	.4	3.5	.3	.7	2.3	6.7	69.1	77.4	2.0	BB	(D)
208	BEVERAGES. . . . .	61	45	4.5	35.5	1.8	3.8	11.9	113.7	131.1	264.3	5.2	FF	(D)
2086	BOTTLED AND CANNED SOFT DRINKS. . . . .	49	39	3.1	23.5	1.0	2.1	5.0	47.5	74.1	121.3	4.5	3.0	37.4
209	MISC. FOODS AND KINDRED PRODUCTS. . . . .	145	52	3.7	20.8	2.9	5.1	14.0	105.9	196.0	301.7	4.2	(NA)	(NA)
2099	FOOD PREPARATIONS, NEC. . . . .	34	12	.7	4.4	.5	.8	2.5	16.8	13.4	29.8	1.6	.8	11.2

# APPENDIX 1 (continued)

## General Statistics for States by Industry Groups and Industries: 1972 and 1967

1972 CENSUS OF MANUFACTURES

1972 Census of Manufactures														
Code	Industry	1972										1967		
		Establishments		All employees		Production workers			Value added by manufacture	Cost of materials <sup>1</sup>	Value of shipments <sup>1</sup>	Capital expenditures, new	All employees	Value added by manufacture
		Total  (number)	With 2D employees or more  (number)	Number  (1,000)	Payroll  (million dollars)	Number  (1,000)	Man-hours  (million)	Wages  (million dollars)	(million dollars)	(million dollars)	(million dollars)	(million dollars)	(1,000)	(million dollars)

## Mississippi

20	FOOD AND KINDRED PRODUCTS. . . . .	304	151	17.0	101.8	12.1	25.4	62.6	224.1	725.4	952.2	18.0	14.6	156.6
201	MEAT PRODUCTS. . . . .	64	29	8.9	49.2	7.5	15.6	37.4	96.9	377.3	473.7	4.9	6.0	46.3
2011	MEATPACKING PLANTS. . . . .	36	10	3.5	23.6	2.6	5.4	16.3	43.6	217.8	261.1	3.0	2.5	27.1
2016	POULTRY DRESSING PLANTS. . . . .	19	17	5.3	24.5	4.8	9.9	20.3	49.5	151.3	200.7	1.6	(NA)	(NA)
202	DAIRY PRODUCTS. . . . .	30	23	1.7	11.4	.7	1.5	4.0	21.8	65.3	87.7	2.1	1.8	27.1
2026	FLUID MILK. . . . .	21	16	1.3	8.8	.5	1.1	2.7	16.8	48.4	65.1	1.6	1.3	17.1
203	PRESERVED FRUITS AND VEGETABLES. . . . .	8	2	.3	1.5	.2	.5	1.0	2.4	4.7	7.1	.3	(NA)	(NA)
204	GRAIN MILL PRODUCTS. . . . .	39	15	1.0	6.7	.7	1.7	4.7	20.1	88.4	108.7	1.6	1.1	19.7
2048	PREPARED FEEDS, NEC. . . . .	33	11	.6	4.3	.4	1.1	2.9	11.0	65.0	76.2	.7	(NA)	(NA)
205	BAKERY PRODUCTS. . . . .	25	13	1.4	10.3	.7	1.5	4.5	25.2	24.5	49.7	1.0	1.3	19.2
2051	BREAD, CAKE, AND RELATED PRODUCTS. . . . .	25	13	1.4	10.3	.7	1.5	4.5	25.2	24.5	49.7	1.0	EE	(O)
207	FATS AND OILS. . . . .	30	24	1.3	7.9	1.1	2.6	6.0	23.1	124.0	149.8	4.8	(NA)	(NA)
2074	COTTONSEED OIL MILLS. . . . .	17	16	.8	4.7	1.7	1.6	3.5	6.6	54.5	63.9	2.5	.7	6.3
208	BEVERAGES. . . . .	60	37	2.1	14.0	.8	1.6	4.0	32.2	36.4	68.3	3.2	2.1	22.8
2086	BOTTLED AND CANNED SOFT DRINKS. . . . .	56	37	2.1	13.8	.8	1.6	3.9	31.8	36.1	67.6	3.2	EE	(O)
209	MISC. FOODS AND KINDRED PRODUCTS. . . . .	46	9	.5	2.0	.4	.5	1.3	5.4	8.8	14.2	.3	(NA)	(NA)

## North Carolina

20	FOOD AND KINDRED PRODUCTS. . . . .	659	307	37.4	249.9	23.5	47.8	133.8	637.9	1 392.5	2 026.2	46.4	36.2	403.3
201	MEAT PRODUCTS. . . . .	156	59	11.6	66.6	9.8	19.3	51.1	125.3	486.0	609.7	6.2	9.7	73.8
2011	MEATPACKING PLANTS. . . . .	80	21	2.4	19.6	1.7	3.5	12.6	36.8	168.8	204.5	2.5	2.3	22.8
2013	SAUSAGES AND OTHER PREPARED MEATS. . . . .	44	12	1.3	8.2	1.0	2.0	5.4	18.8	62.0	80.2	2.2	.7	7.3
2016	POULTRY DRESSING PLANTS. . . . .	32	26	8.0	38.7	7.1	13.7	33.0	69.7	255.2	325.1	1.5	(NA)	(NA)
202	DAIRY PRODUCTS. . . . .	45	33	3.2	22.6	1.6	3.4	9.8	70.5	158.0	228.6	4.0	4.6	63.6
2026	FLUID MILK. . . . .	32	26	2.9	20.4	1.4	3.0	8.7	62.8	141.4	204.2	3.4	4.2	57.9
203	PRESERVED FRUITS AND VEGETABLES. . . . .	24	10	1.5	9.3	1.3	2.7	6.9	35.8	49.7	85.7	3.5	(NA)	(NA)
2035	PICKLES, SAUCES, AND SALAD DRESSINGS. . . . .	11	6	.7	4.6	.6	1.4	3.4	7.7	18.8	26.7	2.0	.9	8.0
204	GRAIN MILL PRODUCTS. . . . .	128	36	2.2	15.0	1.4	3.1	8.9	62.0	254.0	315.5	4.6	2.8	41.2
205	BAKERY PRODUCTS. . . . .	66	45	9.8	74.2	5.0	10.4	30.7	138.1	120.4	257.7	(O)	8.8	108.2
2051	BREAD, CAKE, AND RELATED PRODUCTS. . . . .	59	40	6.6	46.8	3.5	7.5	22.5	96.4	84.1	180.5	5.1	6.3	73.4
207	FATS AND OILS. . . . .	28	16	1.0	7.4	.8	1.8	5.6	25.5	125.7	150.0	1.5	(NA)	(NA)
2077	ANIMAL AND MARINE FATS AND OILS. . . . .	18	9	.6	4.7	.5	1.2	3.9	13.8	18.7	32.1	1.0	.6	8.2
208	BEVERAGES. . . . .	98	76	5.7	43.4	2.1	4.6	14.3	148.7	160.6	309.1	8.8	5.1	59.4
2092	FRESH OR FROZEN PACKAGED FISH. . . . .	17	3	.3	.8	.2	.3	.6	2.1	3.9	5.9	.1	BB	(O)

## Oklahoma

20	FOOD AND KINDRED PRODUCTS. . . . .	330	138	14.3	105.1	9.1	18.7	60.0	238.0	688.0	924.3	15.8	13.8	176.4
201	MEAT PRODUCTS. . . . .	66	27	3.4	28.5	2.8	5.8	20.6	57.1	288.7	344.9	1.8	3.1	38.3
2011	MEATPACKING PLANTS. . . . .	48	17	2.1	22.0	1.6	3.6	15.3	45.4	243.5	287.4	1.1	EE	(O)
2016	POULTRY DRESSING PLANTS. . . . .	6	5	1.0	4.4	1.0	1.8	4.1	7.1	28.5	36.6	.7	(NA)	(NA)
202	DAIRY PRODUCTS. . . . .	32	18	1.7	13.2	.7	1.6	5.7	30.6	96.5	127.2	2.4	2.6	36.0
2026	FLUID MILK. . . . .	17	13	1.4	11.3	.5	1.2	4.5	25.3	70.5	95.9	2.2	2.4	33.0
203	PRESERVED FRUITS AND VEGETABLES. . . . .	21	11	1.7	8.6	1.4	2.8	6.8	18.7	35.7	58.4	1.9	(NA)	(NA)
2033	CANNED FRUITS AND VEGETABLES. . . . .	10	5	1.1	4.3	.9	1.5	3.4	8.5	8.3	16.9	.6	.6	4.2
204	GRAIN MILL PRODUCTS. . . . .	46	22	1.4	11.1	1.0	2.3	7.4	26.1	130.0	155.9	3.3	1.4	21.9
205	BAKERY PRODUCTS. . . . .	40	13	1.9	15.7	1.0	2.0	7.9	37.5	29.4	66.8	1.1	1.9	23.3
207	FATS AND OILS. . . . .	18	8	.5	4.0	.3	.8	2.7	7.3	34.4	41.5	.9	(NA)	(NA)
208	BEVERAGES. . . . .	51	26	2.1	13.2	.7	1.4	3.6	29.9	28.5	58.1	2.2	EE	(O)

## South Carolina

20	FOOD AND KINDRED PRODUCTS. . . . .	254	109	12.1	75.5	7.8	16.0	41.3	176.7	424.9	598.7	11.2	11.5	120.0
201	MEAT PRODUCTS. . . . .	43	17	2.1	12.4	1.7	3.6	9.0	25.5	108.3	132.2	1.3	3.8	36.3
2011	MEATPACKING PLANTS. . . . .	29	11	1.2	8.3	.9	2.1	5.7	16.5	77.5	93.1	1.1	1.4	22.5
2016	POULTRY DRESSING PLANTS. . . . .	7	5	.7	3.2	.6	1.2	2.6	6.7	24.7	30.5	.2	(NA)	(NA)
202	DAIRY PRODUCTS. . . . .	27	17	1.6	11.5	.7	1.4	4.0	37.1	86.4	123.0	1.4	1.6	24.3
203	PRESERVED FRUITS AND VEGETABLES. . . . .	16	8	2.1	12.7	1.9	3.7	10.1	18.9	50.9	69.8	1.5	(NA)	(NA)
204	GRAIN MILL PRODUCTS. . . . .	31	9	.5	3.1	.3	.7	1.7	9.3	28.6	37.9	.5	.5	5.8
205	BAKERY PRODUCTS. . . . .	15	10	1.6	11.5	.9	1.9	6.2	25.2	20.5	45.8	2.2	1.8	19.5
2051	BREAD, CAKE, AND RELATED PRODUCTS. . . . .	15	10	1.6	11.5	.9	1.9	6.2	25.2	20.5	45.8	2.2	1.8	19.5
208	BEVERAGES. . . . .	53	33	2.4	15.8	.8	1.8	4.3	35.8	58.2	94.2	2.9	2.4	22.1



# APPENDIX 1 (continued)

## General Statistics for States by Industry Groups and Industries: 1972 and 1967 1972 CENSUS OF MANUFACTURES

Code	Industry	1972										1967		
		Establishments		All employees		Production workers			Value added by manufacture	Cost of materials¹	Value of shipments¹	Capital expenditures, new	All employees	Value added by manufacture
		Total	With 20 employees or more	Number	Payroll	Number	Man-hours	Wages						
		(number)	(number)	(1,000)	(million dollars)	(1,000)	(million)	(million dollars)	(million dollars)	(million dollars)	(million dollars)	(1,000)	(million dollars)	
Tennessee														
20	FOOD AND KINORED PRODUCTS. . . .	535	257	32.8	257.0	20.4	43.0	143.4	697.9	1 952.4	2 624.6	61.0	32.4	457.6
201	MEAT PRODUCTS. . . . .	108	34	6.7	57.7	5.0	11.5	41.2	117.0	598.2	710.8	11.3	6.5	72.3
2011	MEATPACKING PLANTS . . . . .	66	22	5.1	46.9	3.7	8.3	33.1	86.1	508.3	590.2	6.7	4.9	59.0
2013	SAUSAGES AND OTHER PREPARED MEATS. .	33	8	.9	7.7	.6	1.3	4.8	20.2	69.4	88.1	4.5	.4	5.9
202	DAIRY PRODUCTS . . . . .	66	48	3.5	28.7	1.7	3.4	11.5	68.3	187.9	257.9	4.9	4.4	57.9
2023	CONDENSED AND EVAPORATED MILK. . . .	11	6	.3	2.6	.3	.6	2.0	6.1	30.1	37.3	.3	.5	11.1
2024	ICE CREAM AND FROZEN DESSERTS. . . .	16	11	.6	4.7	.3	.7	2.1	12.1	20.8	33.0	.5	1.1	14.4
2026	FLUID MILK . . . . .	25	20	2.1	18.5	.8	1.5	5.5	43.2	100.6	141.6	3.8	2.2	26.7
203	PRESERVED FRUITS AND VEGETABLES. .	30	15	2.2	12.6	1.8	3.6	8.9	31.7	85.0	118.2	4.4	(NA)	(NA)
2033	CANNED FRUITS AND VEGETABLES . . . .	10	4	.4	1.8	.3	.5	1.1	4.5	8.4	13.0	.2	.2	1.6
204	GRAIN MILL PRODUCTS. . . . .	81	30	3.3	26.6	2.3	5.0	17.8	111.7	254.0	362.0	3.7	3.4	98.9
2041	FLOUR AND OTHER GRAIN MILL PRODUCTS.	31	10	1.2	9.7	.8	1.9	6.3	42.3	94.7	133.6	1.5	EE	101
205	BAKERY PRODUCTS. . . . .	57	38	6.6	52.1	3.8	7.5	25.9	110.5	88.7	195.7	6.1	6.1	65.5
206	SUGAR AND CONFECTIONERY PRODUCTS. .	16	6	1.3	8.2	1.1	2.0	5.8	20.6	19.0	40.1	.8	(NA)	(NA)
207	FATS AND OILS. . . . .	25	11	1.7	15.1	1.2	2.6	9.6	41.5	495.5	528.6	10.0	(NA)	(NA)
208	BEVERAGES. . . . .	81	57	4.9	37.5	1.8	3.8	11.9	145.0	147.0	284.5	10.2	4.4	71.2
209	MISC. FOODS AND KINORED PRODUCTS .	71	18	2.5	18.5	1.7	3.6	10.8	51.6	77.1	126.8	9.5	(NA)	(NA)
2099	FOOD PREPARATIONS, NEC . . . . .	44	14	2.0	15.2	1.5	3.0	9.1	37.9	56.3	92.4	8.9	1.1	15.5

## Texas

20	Food and Kindred products.....	1,468	651	76.7	542.5	50.4	102.4	315.6	1,684.8	3,865.3	5,524.8	108.7	78.7	1,172.3
201	Meat products.....	282	129	16.7	110.4	13.7	28.1	82.6	255.0	1,378.8	1,622.3	19.2	16.2	175.3
2016	Poultry dressing plants.....	34	28	5.2	22.7	4.9	9.1	19.5	45.2	142.6	187.4	3.5	(NA)	(NA)
202	Dairy products.....	110	67	7.5	53.5	2.9	6.3	19.1	129.5	339.4	467.9	14.7	9.3	127.3
2026	Fluid milk.....	66	51	6.3	45.8	2.3	5.0	15.2	115.8	276.8	391.8	10.1	8.2	106.7
203	Preserved fruits and vegetables..	92	45	6.9	40.9	5.7	11.0	29.0	129.1	215.6	344.0	6.5	9.5	101.6
2033	Canned fruits and vegetables.....	25	11	1.5	7.0	1.3	2.1	4.9	23.4	34.1	57.5	.8	2.0	20.3
2035	Pickles, sauces, salad dressings...	23	5	1.1	8.6	.9	1.9	6.3	13.3	61.1	74.5	.9	1.0	5.6
2038	Frozen specialties.....	17	12	1.4	6.3	1.2	2.3	4.8	17.8	16.5	34.3	.6	(NA)	(NA)
204	Grain mill products.....	199	83	7.2	53.6	5.1	10.5	31.5	190.5	549.3	733.4	13.0	7.3	133.5
2041	Flour and other grain mill products	23	11	.9	7.0	.7	1.6	5.1	24.6	74.3	99.1	.6	EE	(D)
2044	Rice milling.....	8	8	1.3	13.0	.9	1.9	6.2	76.8	183.2	253.3	2.9	1.3	40.4
205	Bakery products.....	145	71	10.5	80.6	5.7	11.8	41.1	184.2	148.5	332.6	10.5	11.3	139.4
206	Sugar and confectionery products..	57	17	2.8	18.7	2.2	4.6	13.3	55.0	137.8	188.0	3.4	CC	(D)
207	Fats and oils.....	75	42	3.5	26.6	2.8	6.9	18.4	96.7	287.5	385.5	7.2	EE	(D)
2074	Cottonseed oil mills.....	31	23	1.5	9.7	1.2	2.7	6.8	33.8	112.6	145.8	3.2	1.9	23.5
2077	Animal and marine fats and oils....	32	9	.6	4.3	.4	1.0	2.7	15.2	14.8	29.7	(D)	.8	7.4
2079	Shortening and cooking oils.....	8	7	1.3	12.0	1.0	2.0	8.4	46.8	145.4	194.0	2.4	1.5	43.5

## Virginia

20	FOOD AND KINDRED PRODUCTS.....	507	283	33.8	220.3	24.2	46.8	131.4	612.8	1 361.3	1 965.3	61.6	31.5	392.7
201	MEAT PRODUCTS.....	69	38	9.6	61.0	8.2	16.8	45.9	125.5	499.5	623.0	9.6	7.4	74.9
2011	MEATPACKING PLANTS.....	35	15	4.2	31.6	3.1	6.6	20.8	63.6	286.6	348.9	5.2	4.3	52.4
2016	POULTRY DRESSING PLANTS.....	12	12	4.3	22.4	4.0	8.0	19.9	46.1	171.3	216.9	2.9	(NA)	(NA)
202	DAIRY PRODUCTS.....	47	34	2.9	23.5	1.1	2.3	7.4	58.0	139.9	197.1	11.9	4.2	45.7
2024	ICE CREAM AND FROZEN DESSERTS.....	9	4	.3	3.0	.1	.2	.8	4.8	13.7	18.5	.4	.5	3.9
2026	FLUID MILK.....	35	28	2.5	19.7	.9	1.9	6.0	48.7	120.3	166.8	(0)	3.4	38.5
203	PRESERVED FRUITS AND VEGETABLES..	45	18	3.7	21.4	3.2	5.7	15.1	53.2	86.8	140.0	3.1	(NA)	(NA)
204	GRAIN MILL PRODUCTS.....	52	15	1.0	6.4	.7	1.5	3.9	19.2	91.5	110.0	.9	.9	14.3
205	BAKERY PRODUCTS.....	49	37	4.6	35.2	2.8	5.7	19.1	81.4	68.6	150.2	2.6	4.6	58.3
206	SUGAR AND CONFECTIONERY PRODUCTS..	22	13	2.7	14.5	2.4	4.6	11.8	69.8	156.3	225.9	3.2	(NA)	(NA)
207	FATS AND OILS.....	18	12	.7	5.8	.6	1.3	3.8	26.2	95.6	119.7	1.8	(NA)	(NA)
208	BEVERAGES.....	64	50	4.0	30.3	1.8	3.7	10.9	86.8	120.4	204.1	24.9	4.1	57.0
2086	BOTTLED AND CANNED SOFT DRINKS.....	55	45	3.5	24.3	1.4	2.9	7.0	53.7	80.2	133.5	(0)	3.8	50.0
209	MISC. FOODS AND KINDRED PRODUCTS..	141	66	4.4	22.0	3.6	5.3	13.6	92.5	102.9	195.3	3.6	(NA)	(NA)
2092	FRESH OR FROZEN PACKAGED FISH.....	76	35	2.2	7.6	2.0	2.7	6.0	14.7	26.7	41.4	.6	2.1	10.3
2099	FOOD PREPARATIONS, NEC.....	30	18	1.5	11.3	1.0	1.8	5.8	70.8	67.9	138.7	2.7	1.0	37.3



# APPENDIX 2

## 1972 Census of Wholesale Trade by Kind of Business

SIC Code	Selected kinds of business	Total			Merchant wholesalers		Other operating types <sup>1</sup>		Percentage change, 1967 to 1972 <sup>2</sup> (total)	
		Estab-lish-ments (number)	Sales (\$1,000)	Payroll entire year (\$1,000)	Estab-lish-ments (number)	Sales (\$1,000)	Estab-lish-ments (number)	Sales (\$1,000)	Sales	Payroll entire year
514	Groceries and related products.....	489	1,058,459	56,577	389	721,209	100	337,250	42	44
514	Groceries and related products.....	352	693,258	30,935	273	374,986	79	318,272	52	27
514	Groceries and related products.....	1,784	3,910,100	208,497	1,380	2,230,523	404	1,679,577	58	48
514	Groceries and related products.....	831	1,969,495	97,594	627	909,556	204	1,059,939	26	47
514	Groceries and related products.....	483	787,241	43,050	400	612,919	83	174,322	35	40
514	Groceries and related products.....	734	1,614,624	73,223	582	957,674	152	656,950	30	40
514	Groceries and related products.....	364	658,836	35,025	306	517,051	58	141,785	60	49
514	Groceries and related products.....	886	1,742,865	86,557	648	855,084	238	887,781	37	30
514	Groceries and related products.....	355	843,120	40,728	260	537,013	95	306,107	41	45
514	Groceries and related products.....	452	793,327	40,116	352	516,756	100	276,571	34	34
514	Groceries and related products.....	660	1,765,171	78,574	500	1,111,527	160	653,644	31	36
514	Groceries and related products.....	1,840	4,840,115	224,015	1,399	3,035,121	441	1,804,994	38	45
514	Groceries and related products.....	628	1,444,795	77,320	468	900,070	160	544,725	45	46

# APPENDIX 3

## 1972 Census of Retail Trade by Kind of Business

SIC Code	Kind of business <sup>1</sup>	Estab- lish- ments	Sales	Payroll entire year	Paid employees for week including March 12	Percent change 1967 to 1972 <sup>2</sup>		Approx- imate percent of total sales covered <sup>3</sup>
		(number)	(\$1,000)	(\$1,000)	(number)	Sales	Payroll entire year	
		ALABAMA						
	Food stores, total.....	3,044	1,340,418	97,852	22,906	55	61	88
58	Eating and drinking places, total.....	2,917	346,031	72,581	26,509	94	83	92
		ARKANSAS						
54	Food stores, total.....	1,878	761,835	54,421	12,351	60	65	85
58	Eating and drinking places, total.....	2,081	184,549	38,461	14,947	90	83	88
		FLORIDA						
54	Food stores, total.....	7,133	4,041,957	327,105	73,333	81	79	96
58	Eating and drinking places, total.....	9,762	1,790,740	392,592	132,041	131	116	95
		GEORGIA						
54	Food stores, total.....	4,103	2,046,859	152,378	33,383	68	68	90
58	Eating and drinking places, total.....	4,346	724,943	157,304	50,179	115	103	94
		KENTUCKY						
54	Food stores, total.....	2,414	1,355,243	101,651	22,095	66	73	87
58	Eating and drinking places, total.....	2,952	418,335	88,935	31,800	82	70	92
		LOUISIANA						
54	Food stores, total.....	3,444	1,671,721	124,350	28,280	61	69	88
58	Eating and drinking places, total.....	4,074	482,145	106,721	34,392	73	75	86
		MISSISSIPPI						
54	Food stores, total.....	2,391	822,679	56,243	13,797	67	69	82
58	Eating and drinking places, total.....	1,943	174,016	36,623	13,686	95	93	87
		NORTH CAROLINA						
54	Food stores, total.....	4,739	2,131,742	161,798	35,611	69	79	87
58	Eating and drinking places, total.....	4,790	625,549	137,218	43,959	103	93	91
		OKLAHOMA						
54	Food stores, total.....	2,175	1,154,470	92,519	19,212	56	68	92
58	Eating and drinking places, total.....	3,433	353,939	79,070	31,081	86	70	87
		SOUTH CAROLINA						
54	Food stores, total.....	2,249	1,105,614	80,461	19,053	72	83	87
58	Eating and drinking places, total.....	2,248	301,589	63,889	22,536	132	128	87
		TENNESSEE						
54	Food stores, total.....	3,832	1,707,773	123,808	28,969	62	63	90
58	Eating and drinking places, total.....	4,413	521,510	112,455	38,874	104	94	93
		TEXAS						
54	Food stores, total.....	10,921	5,354,970	413,501	94,957	60	64	94
58	Eating and drinking places, total.....	14,081	1,848,293	408,556	137,909	97	78	92
		VIRGINIA						
54	Food stores, total.....	3,534	2,190,536	188,694	36,839	60	75	94
58	Eating and drinking places, total.....	4,068	633,553	148,041	48,351	84	87	96

Note: Data shown only for establishments with payroll.







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